EPA

PRP PACKAGE

PATRICK BAYOU

DEER PARK, HARRIS COUNTY, TEXAS

TX#: NONE
SWR #: NONE

Brad
Mgr

Please be advised...
This is a duplicate.
I have reserved it in the event the prior pkg.
it may contain more/better
originals. After imaging
it may be recycled.
Thank you
Brad RM

PRP PACKAGE

PATRICK BAYOU

DEER PARK, HARRIS COUNTY, TEXAS

TX#: NONE
SWR #: NONE

98.02

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

March 8, 2000

Section Chief
Cost Recovery Section (6SF-AC)
U. S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

ATTN: Ms. Janice Bivens

RE: Early Potentially Responsible Party Search Package
Scope of Work / FY 2000/01 CERCLIS Preliminary Assessment/Site Inspections Program (Superfund) Number V-986436-01-0

Dear Section Chief:

Copies of all official archived State records, Title documents, and owner(s) and/or operator(s) information acquired by the Texas Natural Resource Conservation Commission (TNRCC) Preliminary Assessment/Site Inspection (PA\SI) Program staff are being sent to you for the following site:

Site	EPA No.
Patrick Bayou Deer Park, Harris County, TX	TXD PENDING

Due to the extensive deed history for properties owners adjacent to this site, only the volume and page number for each deed is included in the search package.

Should you have any questions please feel free to contact me at (512) 239-2514 (Mail Code 142).

Sincerely,

Allan M. Seils, Manager, PA/SI Program
Superfund Site Discovery and Assessment Team
Site Assessment and Management Section
Remediation Division

AMS/ok

Enclosure

cc: Karen Bond, U.S. Environmental Protection Agency, Region 6, Dallas, Texas

PATRICK BAYOU

DEER PARK, HARRIS COUNTY, TEXAS

TX#: PENDING
SWR#: NONE

I. TAX RECORDS FOR ADJACENT PROPERTY OWNERS

II. PLAT MAP

III. NAME & ADDRESSES OF ADJACENT PROPERTY OWNERS

IV. HARRIS COUNTY CITY CLERK'S DEED RECORDS INFO. ON ADJACENT PROPERTY OWNERS

V. TNRCC RECORDS AND CORRESPONDENCE

I. TAX RECORDS FOR ADJACENT PROPERTY OWNERS

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0147

GEON COMPANY
ATTN TAX DEPT
1 GEON CTR
AVON LAKE OH 44012-2343

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	45,963,550	$181,477.88
Harris County Flood Control	0.080000	45,963,550	$36,770.84
Harris County School Equalization	0.006290	45,963,550	$2,891.11
Harris County Port Authority	0.020400	45,963,550	$9,376.56
Harris County Hospital District	0.146500	45,963,550	$67,336.60
San Jacinto College	0.110000	45,963,550	$50,559.91

Total 1999 Taxes Due by January 31, 2000	$348,412.90
Payments Applied to 1999 Taxes	$348,412.90
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description

1000 TIDAL RD 77571

TR 3A
(002*PT TRS 3 & 4)
(IMPS*0440500000199 PC)
ABST 624 G M PATRICK 7.2140 AC

Appraised Values	
100% Land Value	172,830
100% Improvement Value	45,790,720
100% Total Value	45,963,550

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

GEON COMPANY
ATTN TAX DEPT
1 GEON CTR
AVON LAKE OH 44012-2343

Statement Date - February 24, 2000
Account Number
044-050-000-0147
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0199

GEON COMPANY
1 GEON CTR
AVON LAKE OH 44012-2343

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	622,700	$2,458.61
Harris County Flood Control	0.080000	622,700	$498.16
Harris County School Equalization	0.006290	622,700	$39.17
Harris County Port Authority	0.020400	622,700	$127.03
Harris County Hospital District	0.146500	622,700	$912.26
San Jacinto College	0.110000	622,700	$684.97

Total 1999 Taxes Due by January 31, 2000	$4,720.20
Payments Applied to 1999 Taxes	$4,720.20
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
1000 TIDAL RD 77571 TR 3A (IMPS ONLY) (LAND*0440500000147) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	5,634,760
100% Total Value	5,634,760

Exemptions / Deferrals
Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

GEON COMPANY
1 GEON CTR
AVON LAKE OH 44012-2343

Statement Date - February 24, 2000
Account Number
044-050-000-0199
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0192

LUBRIZOL CORP
ATTN:D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
41 TIDAL RD 77536 PT TRS 1H 1-IA 1J 1K 1L 1P 1Q 1T & 4H (IMPS ONLY) (LAND*#0010)(POLLUTION CONTRL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	29,377,040
100% Total Value	29,377,040

Exemptions / Deferrals
Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN:D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0192
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000019221999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0010

LUBRIZOL CORP
ATTN: D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	91,576,520	$361,571.57
Harris County Flood Control	0.080000	91,576,520	$73,261.22
Harris County School Equalization	0.006290	91,576,520	$5,760.16
Harris County Port Authority	0.020400	91,576,520	$18,681.61
Harris County Hospital District	0.146500	91,576,520	$134,159.60
San Jacinto College	0.110000	91,576,520	$100,734.17

Total 1999 Taxes Due by January 31, 2000	$694,168.33
Payments Applied to 1999 Taxes	$694,168.33
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
41 TIDAL RD 77536 PT TRS 1H 1-IA 1J 1K 1L 1P 1Q 1T & 4H (002*PT TRS 1 2 & 3) ABST 624 G M PATRICK 64.8261 AC

Appraised Values	
100% Land Value	1,270,720
100% Improvement Value	90,305,800
100% Total Value	91,576,520

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN: D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0010
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0146

LUBRIZOL CORP
ATTN DON SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Correction Number 04

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	265,220	$1,047.17
Harris County Flood Control	0.080000	265,220	$212.18
Harris County School Equalization	0.006290	265,220	$16.68
Harris County Port Authority	0.020400	265,220	$54.10
Harris County Hospital District	0.146500	265,220	$388.55
San Jacinto College	0.110000	265,220	$291.74

Total 1999 Taxes Due by January 31, 2000	$2,010.42
Payments Applied to 1999 Taxes	$2,010.42
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
TIDAL RD TRS 7J THRU 7N 7P 7Q 7R & 7S (002*PT TR 4) ABST 624 G M PATRICK 13.5316 AC

Appraised Values	
100% Land Value	265,220
100% Improvement Value	0
100% Total Value	265,220

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN DON SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0146
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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Payment Instructions

By Mail

- Make your check payable to Paul Bettencourt, Tax Assessor-Collector. Mr. Bettencourt is the elected Tax Assessor-Collector for Harris County and is, by law, civilly liable for property tax collections. Do not send cash by mail.
- Mail your check or money order with the Payment Coupon at the bottom of this form in the envelope provided.
- Payments must be postmarked on or before January 31st to avoid paying penalty and interest.
- You will receive an official Harris County tax receipt in the mail after your payment has been processed.

In Person

- Bring your Payment Coupon, along with your cash, check or money order to one of the office locations listed below.
- You will receive a receipt for all payments made in person.

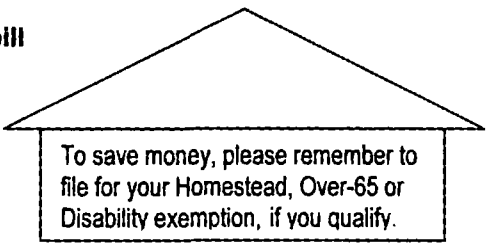
Tax Office Locations

Main Office, 1001 Preston
Baytown, 701 W. Baker Road
Bellaire, 6000 Chimney Rock
Clay Road, 16715 Clay Road
Clear Lake, 16603 Buccaneer Ln.
Cypresswood, 6831 Cypresswood
Humble, 121 W. Main
Kyle Chapman, 7330 Spencer Highway
Macario Garcia, 1001 Macario Garcia Dr.
Mickey Leland, 7300 N. Shepherd
Palm Center, 5300 Griggs
Pasadena, 101 Main
Spring Branch, 1721 Pech Rd.
Wallisville, 14350 Wallisville Rd.

Questions or problems with your tax bill

Contact the Harris County Appraisal District (HCAD) at (713) 957-7800:

- If the name or address on this bill needs to be changed or corrected.
- If you are not the owner of the property listed on this bill.
- If the exemptions for which you are eligible do not appear on this bill.
- If you disagree with the taxable value shown on this bill.



Contact the Harris County Tax Office at (713) 224-1919:

- If this statement does not reflect payments you have already made or if you do not receive your tax receipt by mail.
- If you have any other questions involving problems not listed under the HCAD section above.

Additional Information

If you are over the age of 65:

- You may choose to pay in four equal installments in January, March, May and July without penalty and interest.
- If you have not obtained an Over-65 exemption or desire a deferral of your taxes, contact HCAD at (713) 957-7800.

If you do not pay by the January 31st deadline:

- Penalty and interest accrue each month and there is no provision in State law for waiver of penalty and interest for hardship situations. Penalty and interest may only be waived if your late payment was caused by an HCAD or Tax Office error. A 15% penalty will be added to your tax bill on any unpaid amount after June 30th.
- You are responsible for paying your property taxes on time even if you do not receive a bill.

Tax Office Website

We are here to serve the taxpayers of Harris County. You are encouraged to call our office or visit our website at www.tax.co.harris.tx.us if you need any assistance with property taxes, vehicle registrations or voter registration.

514-81-2569 thru 2620

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0192

LUBRIZOL CORP
ATTN:D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
41 TIDAL RD 77536 PT TRS 1H 1-IA 1J 1K 1L 1P 1Q 1T & 4H (IMPS ONLY) (LAND*#0010)(POLLUTION CONTRL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	29,377,040
100% Total Value	29,377,040

Exemptions / Deferrals
Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN:D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0192
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0010

LUBRIZOL CORP
ATTN: D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	91,576,520	$361,571.57
Harris County Flood Control	0.080000	91,576,520	$73,261.22
Harris County School Equalization	0.006290	91,576,520	$5,760.16
Harris County Port Authority	0.020400	91,576,520	$18,681.61
Harris County Hospital District	0.146500	91,576,520	$134,159.60
San Jacinto College	0.110000	91,576,520	$100,734.17

Total 1999 Taxes Due by January 31, 2000	$694,168.33
Payments Applied to 1999 Taxes	$694,168.33
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
41 TIDAL RD 77536 PT TRS 1H 1-IA 1J 1K 1L 1P 1Q 1T & 4H (002*PT TRS 1 2 & 3) ABST 624 G M PATRICK 64.8261 AC

Appraised Values	
100% Land Value	1,270,720
100% Improvement Value	90,305,800
100% Total Value	91,576,520

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN: D L SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0010
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0146

LUBRIZOL CORP
ATTN DON SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Correction Number 04

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	265,220	$1,047.17
Harris County Flood Control	0.080000	265,220	$212.18
Harris County School Equalization	0.006290	265,220	$16.68
Harris County Port Authority	0.020400	265,220	$54.10
Harris County Hospital District	0.146500	265,220	$388.55
San Jacinto College	0.110000	265,220	$291.74

Total 1999 Taxes Due by January 31, 2000	$2,010.42
Payments Applied to 1999 Taxes	$2,010.42
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
TIDAL RD TRS 7J THRU 7N 7P 7Q 7R & 7S (002*PT TR 4) ABST 624 G M PATRICK 13.5316 AC

Appraised Values	
100% Land Value	265,220
100% Improvement Value	0
100% Total Value	265,220

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
ATTN DON SANDERS
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0146
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0145

MOORE D EDWARD & JOAN
% INVESTMENTS LTD
5601 COURTYARD DR
AUSTIN TX 78731-3303

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	193,230	$762.93
Harris County Flood Control	0.080000	193,230	$154.58
Harris County School Equalization	0.006290	193,230	$12.15
Harris County Port Authority	0.020400	193,230	$39.42
Harris County Hospital District	0.146500	193,230	$283.08
San Jacinto College	0.110000	193,230	$212.55

Total 1999 Taxes Due by January 31, 2000	$1,464.71
Payments Applied to 1999 Taxes	$1,464.71
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
4227 CENTER ST 77536
TR 6G-2 RIDGEWAY S/D ABST 624 G M PATRICK .5303 AC

Appraised Values	
100% Land Value	42,600
100% Improvement Value	150,630
100% Total Value	193,230

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

MOORE D EDWARD & JOAN
% INVESTMENTS LTD
5601 COURTYARD DR
AUSTIN TX 78731-3303

Statement Date - February 24, 2000
Account Number
044-050-000-0145
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0195

OCCIDENTAL CHEMICAL CORP
PO BOX 868
HOUSTON TX 77001-0868

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
1000 TIDAL RD 77536 TRS 2 & 4A 4C 7 & 7A THRU 7H (IMP ONLY)(LAND*0440500000192) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	2,811,870
100% Total Value	2,811,870

Exemptions / Deferrals

Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

OCCIDENTAL CHEMICAL CORP
PO BOX 868
HOUSTON TX 77001-0868

Statement Date - February 24, 2000
Account Number
044-050-000-0195
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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Payment Instructions

By Mail

- Make your check payable to Paul Bettencourt, Tax Assessor-Collector. Mr. Bettencourt is the elected Tax Assessor-Collector for Harris County and is, by law, civilly liable for property tax collections. Do not send cash by mail.
- Mail your check or money order with the Payment Coupon at the bottom of this form in the envelope provided.
- Payments must be postmarked on or before January 31st to avoid paying penalty and interest.
- You will receive an official Harris County tax receipt in the mail after your payment has been processed.

In Person

- Bring your Payment Coupon, along with your cash, check or money order to one of the office locations listed below.
- You will receive a receipt for all payments made in person.

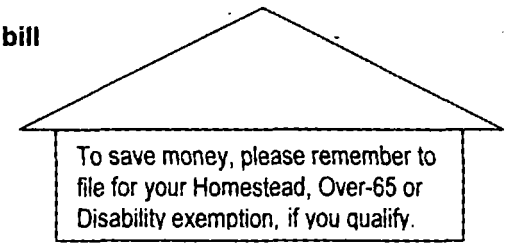
Tax Office Locations

Main Office, 1001 Preston
Baytown, 701 W. Baker Road
Bellaire, 6000 Chimney Rock
Clay Road, 16715 Clay Road
Clear Lake, 16603 Buccaneer Ln.
Cypresswood, 6831 Cypresswood
Humble, 121 W. Main
Kyle Chapman, 7330 Spencer Highway
Macario Garcia, 1001 Macario Garcia Dr.
Mickey Leland, 7300 N. Shepherd
Palm Center, 5300 Griggs
Pasadena, 101 Main
Spring Branch, 1721 Pech Rd.
Wallisville, 14350 Wallisville Rd.

Questions or problems with your tax bill

Contact the Harris County Appraisal District (HCAD) at (713) 957-7800:

- If the name or address on this bill needs to be changed or corrected.
- If you are not the owner of the property listed on this bill.
- If the exemptions for which you are eligible do not appear on this bill.
- If you disagree with the taxable value shown on this bill.



Contact the Harris County Tax Office at (713) 224-1919:

- If this statement does not reflect payments you have already made or if you do not receive your tax receipt by mail.
- If you have any other questions involving problems not listed under the HCAD section above.

Additional Information

If you are over the age of 65:

- You may choose to pay in four equal installments in January, March, May and July without penalty and interest.
- If you have not obtained an Over-65 exemption or desire a deferral of your taxes, contact HCAD at (713) 957-7800.

If you do not pay by the January 31st deadline:

- Penalty and interest accrue each month and there is no provision in State law for waiver of penalty and interest for hardship situations. Penalty and interest may only be waived if your late payment was caused by an HCAD or Tax Office error. A 15% penalty will be added to your tax bill on any unpaid amount after June 30th.
- You are responsible for paying your property taxes on time even if you do not receive a bill.

Tax Office Website

We are here to serve the taxpayers of Harris County. You are encouraged to call our office or visit our website at www.tax.co.harris.tx.us if you need any assistance with property taxes, vehicle registrations or voter registration.

Film # 525-39-3939 thru 4059, includes Rhom + Hass + GEON

~~525-40-0002~~

Bracketed

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0015

OCCIDENTAL CHEMICAL CORP
OCCIDENTAL CHEMICAL CORP
PROPERTY TAX DEPARTMENT
PO BOX 868
HOUSTON TX 77001-0868

Correction Number 02

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	104,949,530	$414,372.23
Harris County Flood Control	0.080000	104,949,530	$83,959.62
Harris County School Equalization	0.006290	104,949,530	$6,601.33
Harris County Port Authority	0.020400	104,949,530	$21,409.70
Harris County Hospital District	0.146500	104,949,530	$153,751.06
San Jacinto College	0.110000	104,949,530	$115,444.48

Total 1999 Taxes Due by January 31, 2000	$795,538.42
Payments Applied to 1999 Taxes	$795,538.42
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
TIDAL RD TRS 2 3 4A 4C 7 & 7A THRU 7H (002*PT TR 4) ABST 624 G M PATRICK 269.9500 AC

Appraised Values	
100% Land Value	5,064,000
100% Improvement Value	99,885,530
100% Total Value	104,949,530

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

OCCIDENTAL CHEMICAL CORP
OCCIDENTAL CHEMICAL CORP
PROPERTY TAX DEPARTMENT
PO BOX 868
HOUSTON TX 77001-0868

Statement Date - February 24, 2000
Account Number
044-050-000-0015
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0017

PRAXAIR INC
PROPERTY TAX SEC M-1
39 OLD RIDGEBURY RD
DANBURY CT 06810-5108

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	17,535,150	$69,234.03
Harris County Flood Control	0.080000	17,535,150	$14,028.12
Harris County School Equalization	0.006290	17,535,150	$1,102.96
Harris County Port Authority	0.020400	17,535,150	$3,577.17
Harris County Hospital District	0.146500	17,535,150	$25,688.99
San Jacinto College	0.110000	17,535,150	$19,288.67

Total 1999 Taxes Due by January 31, 2000	$132,919.94
Payments Applied to 1999 Taxes	$132,919.94
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
622 TIDAL RD 77536 TRS 4G & 8 (002*PT TR 3) ABST 624 G M PATRICK 16.2840 AC

Appraised Values	
100% Land Value	354,670
100% Improvement Value	17,180,480
100% Total Value	17,535,150
Exemptions / Deferrals	

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

PRAXAIR INC
PROPERTY TAX SEC M-1
39 OLD RIDGEBURY RD
DANBURY CT 06810-5108

Statement Date - February 24, 2000
Account Number
044-050-000-0017
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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1,639 line

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0198

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	537,000	$2,120.24
Harris County Flood Control	0.080000	537,000	$429.60
Harris County School Equalization	0.006290	537,000	$33.78
Harris County Port Authority	0.020400	537,000	$109.55
Harris County Hospital District	0.146500	537,000	$786.71
San Jacinto College	0.110000	537,000	$590.70

Total 1999 Taxes Due by January 31, 2000	$4,070.58
Payments Applied to 1999 Taxes	$4,070.58
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A 1B-4 1B-5 1D 1E 1F & 1G (LAND*0440500000184) (9S-ENGR BLDG & GATE HOSPITAL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	537,000
100% Total Value	537,000

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0198
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Houston, Texas 77210-4622

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P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0197

SHELL OIL CO
PO BOX 2099
HOUSTON TX 77252-2099

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1A-2 (IMPS ONLY) (LAND*0440500000185) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	1,839,900
100% Total Value	1,839,900

Exemptions / Deferrals

Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
PO BOX 2099
HOUSTON TX 77252-2099

Statement Date - February 24, 2000
Account Number
044-050-000-0197
Amount Enclosed

PAYMENT COUPON

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Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0196

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	1,902,850	$7,513.02
Harris County Flood Control	0.080000	1,902,850	$1,522.28
Harris County School Equalization	0.006290	1,902,850	$119.69
Harris County Port Authority	0.020400	1,902,850	$388.18
Harris County Hospital District	0.146500	1,902,850	$2,787.68
San Jacinto College	0.110000	1,902,850	$2,093.14

Total 1999 Taxes Due by January 31, 2000	$14,423.99
Payments Applied to 1999 Taxes	$14,423.99
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A 1B-4 1B-5 1D 1E 1F & 1G (IMPS ONLY) (LAND*0184) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	3,805,700
100% Total Value	3,805,700

Exemptions / Deferrals

Pollution Control

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0196
Amount Enclosed

Make check payable to:
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PAYMENT COUPON

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P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0194

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	2,801,080	$11,059.50
Harris County Flood Control	0.080000	2,801,080	$2,240.86
Harris County School Equalization	0.006290	2,801,080	$176.19
Harris County Port Authority	0.020400	2,801,080	$571.42
Harris County Hospital District	0.146500	2,801,080	$4,103.58
San Jacinto College	0.110000	2,801,080	$3,081.19

Total 1999 Taxes Due by January 31, 2000	$21,232.74
Payments Applied to 1999 Taxes	$21,232.74
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A-5 1B & 1G-2 (IMPS ONLY) (LAND*0440500000188) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	28,083,100
100% Total Value	28,083,100

Exemptions / Deferrals

Pollution Control

Pay This Amount

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SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0194
Amount Enclosed

PAYMENT COUPON

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Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0193

SHELL OIL CO
PO BOX 2099
HOUSTON TX 77252-2099

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-1 (IMPS ONLY) (LAND*0440500000181) (POLLUTION CONTROL) ABST 624 G M PATRICK

Appraised Values	
100% Land Value	0
100% Improvement Value	951,400
100% Total Value	951,400

Exemptions / Deferrals

Pollution Control

Pay This Amount

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SHELL OIL CO
PO BOX 2099
HOUSTON TX 77252-2099

Statement Date - February 24, 2000
Account Number
044-050-000-0193
Amount Enclosed

PAYMENT COUPON

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P. O. BOX 4622
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P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0189

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	35,380	$139.69
Harris County Flood Control	0.080000	35,380	$28.30
Harris County School Equalization	0.006290	35,380	$2.23
Harris County Port Authority	0.020400	35,380	$7.22
Harris County Hospital District	0.146500	35,380	$51.83
San Jacinto College	0.110000	35,380	$38.92

Total 1999 Taxes Due by January 31, 2000	$268.19
Payments Applied to 1999 Taxes	$268.19
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1A-4 (TR 15V PER SHELL PLAT) ABST 624 G M PATRICK 2.3208 AC

Appraised Values	
100% Land Value	35,380
100% Improvement Value	0
100% Total Value	35,380
Exemptions / Deferrals	

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0189
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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P. O. BOX 4622
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Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0188

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	65,784,730	$259,737.85
Harris County Flood Control	0.080000	65,784,730	$52,627.78
Harris County School Equalization	0.006290	65,784,730	$4,137.86
Harris County Port Authority	0.020400	65,784,730	$13,420.08
Harris County Hospital District	0.146500	65,784,730	$96,374.63
San Jacinto College	0.110000	65,784,730	$72,363.20

Total 1999 Taxes Due by January 31, 2000	$498,661.40
Payments Applied to 1999 Taxes	$498,661.40
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A-5 1B & 1G-2 (TR 6V PER SHELL PLAT) (IMPS*0440500000194) ABST 624 G M PATRICK 90.5829 AC

Appraised Values	
100% Land Value	1,381,030
100% Improvement Value	64,403,700
100% Total Value	65,784,730
Exemptions / Deferrals	

Pay This Amount

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SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0188
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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P. O. BOX 4622
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PAUL BETTENCOURT
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P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0187

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	458,510	$1,810.34
Harris County Flood Control	0.080000	458,510	$366.81
Harris County School Equalization	0.006290	458,510	$28.84
Harris County Port Authority	0.020400	458,510	$93.54
Harris County Hospital District	0.146500	458,510	$671.72
San Jacinto College	0.110000	458,510	$504.36

Total 1999 Taxes Due by January 31, 2000	$3,475.61
Payments Applied to 1999 Taxes	$3,475.61
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1A-3 (TR 4V PER SHELL PLAT) ABST 624 G M PATRICK 2.6705 AC

Appraised Values	
100% Land Value	40,710
100% Improvement Value	417,800
100% Total Value	458,510
Exemptions / Deferrals	

Pay This Amount

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SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0187
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Houston, Texas 77210-4622

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P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0186

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	552,560	$2,181.67
Harris County Flood Control	0.080000	552,560	$442.05
Harris County School Equalization	0.006290	552,560	$34.76
Harris County Port Authority	0.020400	552,560	$112.72
Harris County Hospital District	0.146500	552,560	$809.50
San Jacinto College	0.110000	552,560	$607.82

Total 1999 Taxes Due by January 31, 2000	$4,188.52
Payments Applied to 1999 Taxes	$4,188.52
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A-1 & 1B-1 (PT TR 10S PER SHELL PLAT) ABST 624 G M PATRICK 36.2426 AC

Appraised Values	
100% Land Value	552,560
100% Improvement Value	0
100% Total Value	552,560
Exemptions / Deferrals	

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0186
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0185

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	450,240	$1,777.68
Harris County Flood Control	0.080000	450,240	$360.19
Harris County School Equalization	0.006290	450,240	$28.32
Harris County Port Authority	0.020400	450,240	$91.85
Harris County Hospital District	0.146500	450,240	$659.60
San Jacinto College	0.110000	450,240	$495.26

Total 1999 Taxes Due by January 31, 2000	$3,412.90
Payments Applied to 1999 Taxes	$3,412.90
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1A-2 (TR 8S PER SHELL PLAT) ABST 624 G M PATRICK 29.5315 AC

Appraised Values	
100% Land Value	450,240
100% Improvement Value	0
100% Total Value	450,240

Exemptions / Deferrals

Pay This Amount

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SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0185
Amount Enclosed

PAYMENT COUPON

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P. O. BOX 4622
Houston, Texas 77210-4622

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Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0184

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	38,938,370	$153,740.37
Harris County Flood Control	0.080000	38,938,370	$31,150.70
Harris County School Equalization	0.006290	38,938,370	$2,449.22
Harris County Port Authority	0.020400	38,938,370	$7,943.43
Harris County Hospital District	0.146500	38,938,370	$57,044.71
San Jacinto College	0.110000	38,938,370	$42,832.21

Total 1999 Taxes Due by January 31, 2000	$295,160.64
Payments Applied to 1999 Taxes	$295,160.64
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1A & 1B-4 (TR 41R PER SHELL PLAT) ABST 624 G M PATRICK 23.0076 AC

Appraised Values	
100% Land Value	350,770
100% Improvement Value	38,587,600
100% Total Value	38,938,370
Exemptions / Deferrals	

Pay This Amount

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SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0184
Amount Enclosed

PAYMENT COUPON

Make check payable to:
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Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0183

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	37,754,640	$149,066.65
Harris County Flood Control	0.080000	37,754,640	$30,203.71
Harris County School Equalization	0.006290	37,754,640	$2,374.77
Harris County Port Authority	0.020400	37,754,640	$7,701.95
Harris County Hospital District	0.146500	37,754,640	$55,310.55
San Jacinto College	0.110000	37,754,640	$41,530.10

Total 1999 Taxes Due by January 31, 2000	$286,187.73
Payments Applied to 1999 Taxes	$286,187.73
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TRS 1B-2 & 1G-1 (TR 40R PER SHELL PLAT) ABST 624 G M PATRICK 30.4894 AC

Appraised Values	
100% Land Value	464,840
100% Improvement Value	37,289,800
100% Total Value	37,754,640

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0183
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000018311999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0182

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	1,102,780	$4,354.11
Harris County Flood Control	0.080000	1,102,780	$882.22
Harris County School Equalization	0.006290	1,102,780	$69.36
Harris County Port Authority	0.020400	1,102,780	$224.97
Harris County Hospital District	0.146500	1,102,780	$1,615.57
San Jacinto College	0.110000	1,102,780	$1,213.06

Total 1999 Taxes Due by January 31, 2000	$8,359.29
Payments Applied to 1999 Taxes	$8,359.29
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1B-3 (TR 37R PER SHELL PLAT) ABST 624 G M PATRICK 1.6450 AC

Appraised Values	
100% Land Value	25,080
100% Improvement Value	1,077,700
100% Total Value	1,102,780

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0182
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000018231999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0181

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	1,049,990	$4,145.68
Harris County Flood Control	0.080000	1,049,990	$839.99
Harris County School Equalization	0.006290	1,049,990	$66.04
Harris County Port Authority	0.020400	1,049,990	$214.20
Harris County Hospital District	0.146500	1,049,990	$1,538.24
San Jacinto College	0.110000	1,049,990	$1,154.99

Total 1999 Taxes Due by January 31, 2000	$7,959.14
Payments Applied to 1999 Taxes	$7,959.14
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-1 (TR 18V PER SHELL PLAT) (IMPS*0440500000193) ABST 624 G M PATRICK 1.1340 AC

Appraised Values	
100% Land Value	17,290
100% Improvement Value	1,032,700
100% Total Value	1,049,990
Exemptions / Deferrals	

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0181
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000018151999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0180

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	1,051,600	$4,152.03
Harris County Flood Control	0.080000	1,051,600	$841.28
Harris County School Equalization	0.006290	1,051,600	$66.15
Harris County Port Authority	0.020400	1,051,600	$214.53
Harris County Hospital District	0.146500	1,051,600	$1,540.59
San Jacinto College	0.110000	1,051,600	$1,156.76

Total 1999 Taxes Due by January 31, 2000	$7,971.34
Payments Applied to 1999 Taxes	$7,971.34
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-3 (TR 7V PER SHELL PLAT) ABST 624 G M PATRICK .9445 AC

Appraised Values	
100% Land Value	14,400
100% Improvement Value	1,037,200
100% Total Value	1,051,600

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0180
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000018071999000000000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0179

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	1,688,330	$6,666.03
Harris County Flood Control	0.080000	1,688,330	$1,350.66
Harris County School Equalization	0.006290	1,688,330	$106.20
Harris County Port Authority	0.020400	1,688,330	$344.42
Harris County Hospital District	0.146500	1,688,330	$2,473.40
San Jacinto College	0.110000	1,688,330	$1,857.16

Total 1999 Taxes Due by January 31, 2000	$12,797.87
Payments Applied to 1999 Taxes	$12,797.87
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-2 (TR 29S PER SHELL PLAT) ABST 624 G M PATRICK 1.7271 AC

Appraised Values	
100% Land Value	26,330
100% Improvement Value	1,662,000
100% Total Value	1,688,330

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0179
Amount Enclosed

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

PAYMENT COUPON

044050000017991999000000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0178

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	162,330	$640.93
Harris County Flood Control	0.080000	162,330	$129.86
Harris County School Equalization	0.006290	162,330	$10.21
Harris County Port Authority	0.020400	162,330	$33.12
Harris County Hospital District	0.146500	162,330	$237.81
San Jacinto College	0.110000	162,330	$178.56

Total 1999 Taxes Due by January 31, 2000	$1,230.49
Payments Applied to 1999 Taxes	$1,230.49
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-5 (PT TR 16S PER SHELL PLAT) ABST 624 G M PATRICK 10.6475 AC

Appraised Values	
100% Land Value	162,330
100% Improvement Value	0
100% Total Value	162,330

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0178
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0177

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	2,361,380	$9,323.44
Harris County Flood Control	0.080000	2,361,380	$1,889.10
Harris County School Equalization	0.006290	2,361,380	$148.53
Harris County Port Authority	0.020400	2,361,380	$481.72
Harris County Hospital District	0.146500	2,361,380	$3,459.42
San Jacinto College	0.110000	2,361,380	$2,597.52

Total 1999 Taxes Due by January 31, 2000	$17,899.73
Payments Applied to 1999 Taxes	$17,899.73
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-4 (TR 14S PER SHELL PLAT) ABST 624 G M PATRICK 9.2997 AC

Appraised Values	
100% Land Value	141,780
100% Improvement Value	2,219,600
100% Total Value	2,361,380

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0177
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000017731999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0176

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	7,180	$28.35
Harris County Flood Control	0.080000	7,180	$5.74
Harris County School Equalization	0.006290	7,180	$0.45
Harris County Port Authority	0.020400	7,180	$1.46
Harris County Hospital District	0.146500	7,180	$10.52
San Jacinto College	0.110000	7,180	$7.90

Total 1999 Taxes Due by January 31, 2000	$54.42
Payments Applied to 1999 Taxes	$54.42
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
5600 LA PORTE FWY 77536 TR 1C-6 (TR 50R PER SHELL PLAT) ABST 624 G M PATRICK .4709 AC

Appraised Values	
100% Land Value	7,180
100% Improvement Value	0
100% Total Value	7,180
Exemptions / Deferrals	

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

SHELL OIL CO
ATTN PROPERTY TAX DEPT
PO BOX 4854
HOUSTON TX 77210-4854

Statement Date - February 24, 2000
Account Number
044-050-000-0176
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000017651999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0016

ROHM & HAAS CO
KPMG PEAT MARWICK SALT
700 LOUISIANA ST STE 3100
HOUSTON TX 77002-2729

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	7,489,160	$29,569.45
Harris County Flood Control	0.080000	7,489,160	$5,991.33
Harris County School Equalization	0.006290	7,489,160	$471.07
Harris County Port Authority	0.020400	7,489,160	$1,527.79
Harris County Hospital District	0.146500	7,489,160	$10,971.62
San Jacinto College	0.110000	7,489,160	$8,238.08

Total 1999 Taxes Due by January 31, 2000	$56,769.34
Payments Applied to 1999 Taxes	$56,769.34
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
6600 LA PORTE FWY 77536 TR 4 ABST 624 G M PATRICK 408.3933 AC

Appraised Values	
100% Land Value	7,489,160
100% Improvement Value	0
100% Total Value	7,489,160

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

ROHM & HAAS CO
KPMG PEAT MARWICK SALT
700 LOUISIANA ST STE 3100
HOUSTON TX 77002-2729

Statement Date - February 24, 2000
Account Number
044-050-000-0016
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000001631999000000000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0175

LUBRIZOL CORP
PO BOX 158
DEER PARK TX 77536-0158

Correction Number 04

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	29,410	$116.12
Harris County Flood Control	0.080000	29,410	$23.53
Harris County School Equalization	0.006290	29,410	$1.85
Harris County Port Authority	0.020400	29,410	$6.00
Harris County Hospital District	0.146500	29,410	$43.09
San Jacinto College	0.110000	29,410	$32.35

Total 1999 Taxes Due by January 31, 2000	$222.94
Payments Applied to 1999 Taxes	$222.94
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
TIDAL RD PT TRS 1H 1-IA 1J 1K 1L 1P 1Q 1T & 4H ABST 624 G M PATRICK 1.5002 AC

Appraised Values	
100% Land Value	29,410
100% Improvement Value	0
100% Total Value	29,410

Exemptions / Deferrals

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

LUBRIZOL CORP
PO BOX 158
DEER PARK TX 77536-0158

Statement Date - February 24, 2000
Account Number
044-050-000-0175
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

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PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0014

STATE OF TEXAS
CAPITOL STATION
AUSTIN TX 78711

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	0	$0.00
Harris County Flood Control	0.080000	0	$0.00
Harris County School Equalization	0.006290	0	$0.00
Harris County Port Authority	0.020400	0	$0.00
Harris County Hospital District	0.146500	0	$0.00
San Jacinto College	0.110000	0	$0.00

Total 1999 Taxes Due by January 31, 2000	$0.00
Payments Applied to 1999 Taxes	$0.00
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
LA PORTE RD 77536 TRS 4E & 13B (NM) ABST 624 G M PATRICK 13.3730 AC

Appraised Values	
100% Land Value	0
100% Improvement Value	0
100% Total Value	0

Exemptions / Deferrals
Exempt Property

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

STATE OF TEXAS
CAPITOL STATION
AUSTIN TX 78711

Statement Date - February 24, 2000
Account Number
044-050-000-0014
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000001481999000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0191

TAUB H BEN & MARCY E
TEXAN BLDG 4TH FLR
333 WEST LOOP N
HOUSTON TX 77024-7709

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	2,240	$8.84
Harris County Flood Control	0.080000	2,240	$1.79
Harris County School Equalization	0.006290	2,240	$0.14
Harris County Port Authority	0.020400	2,240	$0.46
Harris County Hospital District	0.146500	2,240	$3.28
San Jacinto College	0.110000	2,240	$2.46

Total 1999 Taxes Due by January 31, 2000	$16.97
Payments Applied to 1999 Taxes	$16.97
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
HWY 225 77536
.3333 U/D INT IN TR 5 (054*TR 1) (103.6070 AC) ABST 624 G M PATRICK 34.5322 AC

Appraised Values	
100% Land Value	353,430
100% Improvement Value	0
100% Total Value	353,430

Exemptions / Deferrals

Farm Productivity

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

TAUB H BEN & MARCY E
TEXAN BLDG 4TH FLR
333 WEST LOOP N
HOUSTON TX 77024-7709

Statement Date - February 24, 2000
Account Number
044-050-000-0191
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000019141999000000000000000000000000000000000000000000000000

PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

1999 Property Tax Statement

Statement Date
February 24, 2000
Account Number
044-050-000-0190

TAUB H BEN & MARCY E
TEXAN BLDG 4TH FLR
333 WEST LOOP N
HOUSTON TX 77024-7709

Taxing Jurisdiction	Rate per $100	Taxable Value	Taxes
Harris County	0.394830	220	$0.87
Harris County Flood Control	0.080000	220	$0.18
Harris County School Equalization	0.006290	220	$0.01
Harris County Port Authority	0.020400	220	$0.04
Harris County Hospital District	0.146500	220	$0.32
San Jacinto College	0.110000	220	$0.24

Total 1999 Taxes Due by January 31, 2000	$1.66
Payments Applied to 1999 Taxes	$1.66
Total Current Taxes Due (including penalties)	$0.00
Prior year(s) delinquent taxes due (if any)	$0.00
Total Amount Due March 31, 2000	**$0.00**

Property Description
P ST 77536
.3333 U/D INT IN TR 5T (054*PT TR 9 TR 2) (10.3799 AC) ABST 624 G M PATRICK 3.4596 AC

Appraised Values	
100% Land Value	25,930
100% Improvement Value	0
100% Total Value	25,930

Exemptions / Deferrals

Farm Productivity

Pay This Amount

Detach at the perforation and return this coupon with your payment. Keep top part for your records

TAUB H BEN & MARCY E
TEXAN BLDG 4TH FLR
333 WEST LOOP N
HOUSTON TX 77024-7709

Statement Date - February 24, 2000
Account Number
044-050-000-0190
Amount Enclosed

PAYMENT COUPON

Make check payable to:
PAUL BETTENCOURT
Tax Assessor-Collector
P. O. BOX 4622
Houston, Texas 77210-4622

044050000019061999000000000000000000000000000000000000000000000000

II. PLAT MAP

III. NAME & ADDRESSES OF ADJACENT PROPERTY OWNERS

ADJACENT PROPERTY OWNERS:

Geon Company
1 Geon Center
Avon Lake OH 44012-2343
(Property: 1000 Tidal Rd)

Lubrizol Corp
Attn: D. L. Sanders
PO Box 158
Deer Park TX 77536-0158
(Property: 41 Tidal Rd)

Edward D. & Joan Moore
%Investments LTD
5601 Courtyard Dr.
Austin, TX 78731-3303
(Property: 4227 Center Street)

Occidental Chemical Corp.
Property Tax Department
P. O. Box 868
Houston, TX 77001-0868
(Property: 1000Tidal Rd)

Praxair Inc.
39 Old Ridgebury Rd.
Danbury, CT 06810-5108
(Property: 622 Tidal Rd)

Rohm & Haas Co
KPMG Peat Marwick Salt
700 Louisiana ST STE 3100
Houston, TX 77002-2729
(Property: 6600 La Porte FWY)

Adjacent Property Owners

Shell Oil Company
ATTN: Property Tax Dept
PO Box 4854
Houston, TX 77210-4854
(Property: 5600 La Porte FWY)

State of Texas
Capitol Station
Austin, TX 7811
(Property: La Porte Rd)

Ben H. & Marcy E. Taub
Texan Bldg. 4th FLR
333 West Loop N
Houston, TX 77024-7709
(Property: Hwy 225)

IV. HARRIS COUNTY CITY CLERK'S DEED RECORDS INFO. ON ADJACENT PROPERTY OWNERS

VOLUME AND PAGE NUMBER OF DEED RECORDS FOR ADJACENT PROPERTY OWNERS

Company Name	Film Number	Page Number
Lubrizol & Shell	105-37	1378 thru 1380
Lubrizol Corp	514-81	2569 thru 2620
Shell Oil	142-11	1002 thru 1025
Geon Company	527-43	1845 thru 1968
Ben H. Taub	186-02	0559 thru 561
Occidental, Praxair, Geon, Rhom & Haas	525-39	3939 thru 4059

V. TNRCC CORRESPONDENCE & RECORDS

****
*** TX REPORT ***
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TNRCC

Protecting Texas by Reducing and Preventing Pollution

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TO:

Name J.D. Thompson (Region 4)

Organization Remediation Division
Site Assessment and
Management Section
SDDAP Region 4

FAX Number 817/795-2519

FROM: TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Name Allan M. Seils

Division/Region Remediation Division
Site Assessment and
Management Section
SSDAP - Central Office

Telephone Number 512/239-2514

FAX Number 512/239-4814

NOTES:

RE: Patrick Bayou
TXD PENDING
Deer Park, Harris County, Texas

ATTACHED IS THE SSI WORK ORDER FOR THIS SITE. I HAVE A LOT OF FILE INFORMATION ON THIS SITE. ALSO, YOU WILL NEED TO VISIT REGION 12 OFFICES TO REVIEW FILES AND DO A SITE RECONN BEFORE PREPARING THE WORK PLAN. COORDINATE WITH JOHNNY KENNEDY.

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Name	**J.D. Thompson (Region 4)**
Organization	**Remediation Division Site Assessment and Management Section SDDAP Region 4**
FAX Number	**817/795-2519**

FROM: **TEXAS NATURAL RESOURCE CONSERVATION COMMISSION**

Name	**Allan M. Seils**
Division/Region	**Remediation Division Site Assessment and Management Section SSDAP - Central Office**
Telephone Number	**512/239-2514**
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Interim Report

Patrick Bayou Pollutant Source Study

Prepared for:

Lubrizol

OxyChem

Shell

Prepared by:

PARSONS ENGINEERING SCIENCE, INC.

February 1999

APR 1 9 1999

Mr. Ted Brenneman, Environmental Manager
Houston Chemical Complex
Occidental Chemical Corporation
P.O. Box 500
Deer Park, Tx 77536-0500

Dear Mr. Brenneman:

Thank you for submitting the Interim Report - Patrick Bayou Pollutant Source Study for our Review. This report was submitted to us via a February 26, 1999 letter from Parsons Engineering Science. This report served to present and evaluate data from the first three rounds of sampling of process water discharges from Occidental, Shell and Lubrizol.

We have reviewed the report, and have also incorporated review comments from the Texas Natural Resource Conservation Commission (TNRCC). Overall, we believe the report contains much useful information. The compilation of all the data collected is of high quality and utility. We appreciate the thoroughness and attention to detail in the tabular data summaries and the narrative description of the sampling activities.

We have several comments on the report, concerning the data evaluation and interpretation. However, rather than modifying the interim report, we request that you take these comments into account when preparing the final report, at the conclusion of the study. These comments are as follows:

1. Table 1 on page 3-5 specifies a critical dilution for dischargers to Patrick Bayou. Several of these critical dilutions did not appear correct. For example, the critical dilution of 8% for Oxychem 001 is not realistic. The discharge is to a shallow, tidal, effluent-dominated bayou with limited upstream flow and mixing. The critical dilution for Shell Oil of 16% also does not appear to reflect available instream dilution. Table 1 does not list the flow for Shell Oil. Assuming a discharge of 5 million gallons per day (mgd), the Shell discharge would constitute almost 50% of the stream, given the upstream flows from Deer Park (4.5 mgd) and Lubrizol (1.0 mgd). The TNRCC is in the process of re-evaluating these critical dilutions to accurately estimate receiving water concentrations of pollutants of concern. The basis for the 7Q2 and harmonic mean flows were not included. The 7Q2 and harmonic mean flows for City of Deer Park (1.36 cubic feet per second (cfs) and 1.72 cfs, respectively) are incorrect. During summer critical conditions there is no upstream flow in Patrick Bayou.

TABLE OF CONTENTS

TABLE OF CONTENTS ..... *i*

SECTION - 1 INTRODUCTION 1-1

1.1 BACKGROUND 1-1
1.2 PROJECT DESCRIPTION 1-1
1.3 ORGANIZATION OF INTERIM REPORT 1-3

SECTION - 2 SAMPLE COLLECTION & ANALYSIS 2-1

2.1 CLEAN SAMPLING 2-1
2.2 SAMPLE EVENTS 2-2
2.2.1 First Sampling Round 2-2
2.2.2 Second Sampling Round 2-2
2.2.3 Third Sampling Round 2-3
2.3 QUALITY ASSURANCE PROGRAM 2-4

SECTION - 3 SAMPLE RESULTS & DISCUSSION 3-1

3.1 ANALYTICAL RESULTS 3-1
3.1.1. Occidental Chemical Corporation 3-1
Intake 3-1
Outfall 001 3-2
Outfall 002 3-2
Outfall 003 3-2
Outfall 005 3-3
3.1.2 Lubrizol Corporation 3-3
Outfall 001 3-3
3.1.3 Shell Oil Company 3-4
Outfall R-001 (Shell Refinery) 3-4
Outfall C-001 (Shell Chemical) 3-4
3.1.4 Deer Park Area 3-4
3.2 TEXTOX EVALUATION 3-4
3.3 OUTFALL CONCENTRATIONS AND MASS LOADING DATA FOR SELECTED PARAMETERS 3-7
3.4 QUALITY ASSURANCE SUMMARY 3-8

SECTION - 4 CONCLUSIONS 4-1

to be collected. This report is the interim project report following the completion of the first three rounds of data collection.

The samples have been collected on three separate occasions during the six month time span. In addition, low detection methods and clean sampling protocol have been used for many parameters of concern. The first round of process sampling was completed March 4 -5, 1998, the second round May 19 - 20, 1998, and the third round August 11 - 13, 1998. The last sampling round included collection of a sample from the location near the City of Deer Park wastewater treatment plant outfall which also discharges into the Patrick Bayou, namely from the tributary of Patrick Bayou as it crosses under the railroad trestle, prior to tidal influence.

The map showing the locations of the industrial dischargers and their outfalls is presented in Figure 1. The outfalls sampled included four process outfalls plus one Intake at OxyChem (OxyChem 001, 002, 003, 005, and Intake), one process outfall at Lubrizol (Lubrizol 001), and two process outfalls at Shell (R-001 and C-001). The outfall R-001 at Shell is from the Shell Refinery and the outfall C-001 is from the Shell Chemical.

During this study, the physical sample location for outfall C-001 was changed. During the first sampling event, samples were taken from the outfall which discharged through the weir directly into the channel of Patrick Bayou (Outfall C001). However, beginning May 1, 1998, the Shell Chemical outfall started discharging directly to the Houston Ship Channel (HSC) through a new outfall 004. The new outfall discharges the wastewater via a pipeline originating at a pump intake sump at the chemical treater. Therefore, during the second and third sampling events the Shell Chemical discharge (outfall C-001) sample location was relocated to the pump intake sump of the new outfall 004. The wastewater at both these locations should be considered the same quality, since only the sampling point is different.

An intake sample was collected at OxyChem, because HSC water is used for once through non-contact process cooling and is the largest volume source of water discharged at OxyChem outfalls 001, 002, and 003.

Clean sampling techniques were used by the trained Parsons ES personnel (Appendix A). Two different laboratories were involved in analyses of retrieved samples. The Trace Element Research Laboratory (TERL), located at Texas A&M University in College Station, Texas, executed analysis for metals and conventional parameters. Organics, including dioxins/furans, analyses were performed by the Toxic Contaminant Research Laboratory (TCRL) of Wright State University, in Dayton, Ohio.

1.3 ORGANIZATION OF INTERIM REPORT

We have divided this report into the following four sections:

- ***Section 1:*** Presents a brief summary of the project background and introduces the report.
- ***Section 2:*** Describes the procedures followed in collection and handling of the samples. Also briefly presents the analyses performed on these samples.
- ***Section 3:*** Presents the sample results and compares them to the TEXTOX model calculated levels and the historical concentrations of selected parameters.
- ***Section 4:*** Summarizes the conclusions.

To facilitate review of the text, the tables and figures referenced in the text are presented at the end of each section. Appendices have also been included to provide supporting information to the interim report.

Wooden or PVC laths were used to position the sample tubing. The sampling points were selected to ensure no metal structures were within close proximity of the sample. Also, the sampling points were chosen as close to the center of the outfall as possible.

The sample team for this study consisted of two two-person teams. The first team was responsible for sites at OxyChem and the second team was responsible for sites at Lubrizol, Shell, and Deer Park area when sampled. However, during each of the sample rounds, both the teams worked on sample set-up and collection at outfall 001 at OxyChem to establish the standard procedures to be followed by both the teams at all the other sample locations. The "Clean hand - Dirty hand" technique, as described in EPA Method 1669, was used in sample set-up and collection.

In this technique, one member of the two-person sampling team is designated as "dirty hands", the second member is designated as "clean hands." All activities involving contact with the sample bottle are handled by the individual designated as "clean hands". "Dirty hands" is responsible for all the other activities that do not involve direct contact with the sample.

Automatic samplers were programmed to sample every 15 minutes for 24 hours. However, due to the sample holding time restrictions some of the samples were collected before the 24-hour sample period was finished. Coolers with the composite samples were brought to the OxyChem's wastewater treatment plant laboratory for aliquoting. Aliquoting was performed in a clean environment at the laboratory. Dr. Paul Booth from TERL and Parsons ES personnel performed the aliquoting. Hair cap and tyvek® suit were worn for aliquoting to minimize contamination. Gloves were changed for each locations and also when ever surfaces other than sample containers were touched.

2.2 SAMPLE EVENTS

Following is a brief description of the conditions during the first three sample rounds. The section also delineates the general procedures followed during these three events.

2.2.1 First Sampling Round

The first sample collection round was completed March 4/5, 1998. The sampling process started on March 4, 1998 in the afternoon. The weather was cloudy, windy and the temperature in upper sixties to low seventies.

The collection of samples was done on March 5, 1998. That day the weather was sunny, hot, with light breeze and the temperature in the mid seventies. All the composite samples were transferred from the composite bottles into properly labeled and precleaned containers, and put in the coolers. The coolers holding the samples for the organic analyses were shipped overnight by FedEx® to the Wright State University laboratory. The samples designated for metals analyses, also stored in the coolers, were taken by Dr. Booth to the TERL.

2.2.2 Second Sampling Round

The second sample collection round was completed May 19/20, 1998. The sampling process started on May 19, 1998 in the morning. The weather was sunny to mostly

at equidistant locations along the circumference of the pond. . Due to the volume of the pond, Parsons believes this sample is representative of what is discharged over a 24 hours period.

The pH of the samples was measured during the time of transfer into precleaned bottles. The collected samples were then aliquoted, transferred into precleaned and prelabeled bottles, placed into the coolers and subsequently transported to the designated laboratories for required analyses.

Three additional rounds of sampling will be conducted at all the OxyChem, Shell, and Lubrizol process wastewater outfalls. One of these three sampling rounds was completed on January 21, 1999. Also, one additional round of sampling will be conducted at the Deer Park location. The City of Deer Park location was not sampled during the January 21, 1999 event.

2.3 QUALITY ASSURANCE PROGRAM

Quality assurance (QA) procedures were implemented for field sampling, chain of custody, laboratory analyses and reporting.

To assure the proper sampling procedures one field duplicate (FD) was collected on each separate sampling occasion. Two additional samplers were always set at the outfall 001 at the Occidental Chemical Corporation. One sampler was dedicated to collect the field replicate for the organic analyses and the second sampler was dedicated to collect field replicate for the metals analyses.

To assure the quality of data resulting from the analysis, one matrix spike/matrix spike duplicate (MS/MSD) was required per 20 samples determined for analysis of organics and metals. On each sampling occasion, a time weighted composite sample dedicated to serve this purpose was collected at Occidental Chemical Corporation outfall 002 using a separate sampler. The data validation report is provided in Appendix B.

All targeted metals were detected in measurable concentrations on each sampling event. The intake also showed the highest average and maximum concentration of the total recoverable selenium from all characterized wastestreams, but still almost seventy times below applicable WQS. The total CDD/CDF equivalents concentration at this sample location increased by almost 8 times from first sample event to the third event. Concentration of all parameters used for calculation of the total CDD/CDF equivalent were below the detectable concentrations during the second sample event. The coefficient of variance for total CDD/CDF equivalent at this location is 146%.

Outfall 001

Similarly to the Intake, Outfall 001 was sampled on each distinct sampling event. This outfall includes once through cooling water, process water from the mercury cell process, and stormwater. This outfall location was designated for collection of field duplicate samples for the QA/QC assurance.

The only organic compounds detected on each individual sampling occasion in measurable concentrations were hexachlorobenzene, arochlor 1248, octa CDD, and octa CDF.

Metals analyses of the Outfall 001 samples revealed a presence of all target metals in measurable concentrations during all the three sample events.. In addition, the total recoverable mercury concentrations at this outfall were the highest among all the tested outfalls. The highest concentration of mercury, 2.47 µg/L was observed during the second sample event. Field Duplicate samples collected from this outfall showed similar trend and concentration of mercury. The highest relative percent difference (RPD) between the field duplicate and the original sample was 7.56%, well below the acceptable criteria, 24% published in EPA Method 1631 for mercury. The coefficient of variance for mercury data was 20%.

Outfall 002

The Outfall 002 was sampled during the all three separate testing events. Outfall 002 contains process water, once through cooling water and stormwater during rain events. Analyses of the targeted parameters revealed that a number of organic compounds and all metals were present at each sampling event in measurable concentrations. Organics which were always detected include: pyrene, hexachlorobenzene, hepta and octa CDDs, 2378 TCDF, 123478HxCDF, and 123678 HxCDF. The outfall exhibited the highest total CDD/CDF equivalents concentrations among any of the outfalls and the highest average concentrations for fluoranthene and arochlor 1248.

Also, total recoverable copper concentration at this outfall steadily increased over the three sample events from a low of 3.9 µg/L during the first event to a high of 19.3 µg/L during the third event. Coefficient of variance of the copper data was 77%.

Outfall 003

Outfall 003 contains once through cooling water, process water, and stormwater during rain events. Results from the three sampling rounds show presence of several organics compounds (pyrene, hexachlorobenzene, hexachlorobutadiene, arochlor 1248,

collected only 500 mL of sample in the first 20.5 hours sampling. The sampler was then reprogrammed to collect 3,500 mL sample in the next 3.5 hours. It is not clear if the sample compositing influenced the concentration of Zinc as the concentrations of all the other target analytes seemed to be inline with the first and third round samples.

The outfall also exhibited total recoverable nickel concentrations higher than all the other sample locations during the first two sample events. Total recoverable mercury and Arochlor-1248 were below the detection limit during two out of three sample rounds. All the dioxins and furans that are used for the calculation of total CDD/CDF equivalent were below the detectable limits during this study.

3.1.3 Shell Oil Company

Outfall R-001 (Shell Refinery)

The wastewater stream at the Shell Refinery outfall was sampled on each separate sampling event. This outfall contains steam condensate and blowdowns. Only two organic compounds, hepta and octa CDD, were present in measurable concentrations on all three occasions. The tested metals were always detected in measurable concentrations. The outfall was the only one from the all tested outfalls which exhibited a presence of acenaphthylene in measurable concentration. Arochlor-1248 was always measured below the detection limit during this study.

Outfall C-001 (Shell Chemical)

The outfall was sampled on each separate testing occasion. This outfall contains process wastewater treated in the biological treatment system for the chemical plant. Only two organics were present in measurable concentrations on each sampling occasion (pyrene and octa CDF). Pyrene exhibited the highest average concentration among the all tested outfalls.

Total recoverable mercury and Arochlor-1248 were measured only once above the detection limit. All the selected dioxins and furans that are used to calculate the total CDD/CDF equivalent concentration were always below the detection limit during this study.

3.1.4 Deer Park Area

As required in the work plan, this sample was collected once on the third sampling event (August 11/13, 1998). The sample was collected from the stream channel of Patrick Bayou immediately downstream of the Deer Park wastewater treatment plant outfall. The chemicals present in the measurable concentrations included: anthracene, benzo(k)fluoranthene, fluoranthene, naphthalene, phenanthrene, pyrene, arochlor 1248, tetra CDDs, octa CDD, barium, copper, lead, mercury, nickel, selenium, vanadium, and zinc.

3.2 TEXTOX EVALUATION

The TNRCC has developed a computerized permitting tool called "TEXTOX" which is used by staff permit writers in drafting water quality based permit limits. This tool is also available to permittees and outside consultants to review data prior to submitting a

Other parameters did not show any potential concern for any outfall. Summary of all results from the three sampling events are presented in Appendix C.

It should be noted that the average daily concentrations represent the arithmetic mean from the set of three daily analyses. The calculation of averages for the three sampling events follows the TNRCC implementation procedures for wastewater permits. If a target analyte was detected in any one of the three samples, then the non-detected values were averaged at one-half the detection limit. If a sample is data flagged as a "UJ" or "UB", then it also will be added at one-half the detection. If the sample has a "J" flag, it is an estimated value and is averaged as that estimate. If all samples were below the detection limit, then a non-detected (nd) was placed in the summary table. Table 7 presents the summary of statistical data produced from the first three sample rounds. Table 2 compares the average daily concentrations obtained from the results of the three sampling efforts to the average daily concentrations obtained from the TEXTOX output. The results reveal that the OxyChem outfall 002 exhibits the greatest potential number of parameters above the screening levels, when compared to the calculated daily average concentration of the human health or aquatic life toxic levels. The TEXTOX levels for this outfall were exceeded for four of the selected parameters, namely copper (2.2x), mercury (1.3x), arochlor 1248 (7.2x), and total CDD/CDF equivalents (6.9x).

Lubrizol outfall 001 showed three parameters above the model levels, namely nickel (1.01x), zinc (1.7x), and arochlor 1248 (1.3x). The Oxychem outfall 001 and water from the vicinity of Deer Park including the WWTP outfall 001, showed each one parameter above the model levels - mercury (2.4x) and arochlor 1248 (5.7x) - respectively. OxyChem outfalls 003 and 005, as well as Shell outfalls R-001 (Shell Refinery) and C-001 (Shell Chemical), did not exhibit any exceedance of the TEXTOX daily average levels for any of the selected parameter.

Table 3 compares the maximum daily concentration measured in the course of this study to the maximum daily concentration obtained from the TEXTOX evaluation efforts. Comparison of the measured maximum daily concentrations to the calculated daily maximum concentration of the human health or aquatic life toxic levels indicated OxyChem outfall 002 as the outfall with the potentially greatest number of parameters above the screening levels. The TEXTOX daily maximum levels were exceeded for copper (1.9x), arochlor 1248 (6.4x), and for total CDD/CDF equivalents (3.85x). Concentration of all the three parameters at outfall 002 are less than the concentrations measured at the HSC water intake location.

Three other outfalls showed daily maximum concentrations greater than the TEXTOX model levels, each for one tested parameter. OxyChem outfall 001 demonstrated concentrations potentially above model levels for mercury (1.4x), Lubrizol 001 outfall showed slight elevation for zinc, and Deer Park sample for arochlor 1248 (2.8x). None of the parameters at OxyChem outfalls 003 and 005, as well as Shell outfalls R-001 (Shell Refinery) and C-001 (Shell Chemical), had concentrations above the TEXTOX model daily maximum levels.

Concentrations of selected parameters measured at OxyChem's water intake are also presented in Tables 2 and 3. However, concentrations observed at this location are compared to Texas State Water Quality Standards (TSWQS). Daily average

concentration is represented by the intake concentration. The highest mercury mass loading during this sampling event was from the OxyChem outfall 001.

Table 6, presented at the end of this section, compares the calculated mass loadings of selected parameters in individual outfalls for the March sampling event to the averaged mass loadings obtained from the historical reports for certain time periods. The data indicate that at two outfalls, OxyChem 001 and Lubrizol 001 the loadings reported were higher than the historical average. The OxyChem 001 mercury mass loading at the time of March sampling was greater than the historical mass loading data averaged over seven months period. Similarly the Lubrizol outfall 001 was higher than the averaged historical mass loading for nickel and zinc.

3.4 QUALITY ASSURANCE SUMMARY

This section briefly discusses deviations from the QAPP, other laboratory problems, QC problems leading to rejection or qualification of data, and the overall usability of data. Samples were analyzed for selected SVOCs, dioxin/furans, selected metals, alkalinity, total suspended solids (TSS), total dissolved solids (TDS), and total organic carbon (TOC).

Analyses for organic parameters were performed by the Toxic Contaminant Research Laboratory (TCRL) of Wright State University, in Dayton, Ohio. All the inorganic analyses was performed by the Trace Elements Research Laboratory (TERL) at Texas A&M University, College Station, Texas.

No major QA/QC problems were found during the validation of the data submitted by the laboratories. No reported results have been qualified unusable. Minor QA/QC problems leading to data qualification included: laboratory blank contamination and surrogate outliers. Surrogate outliers were found only in the organic data from the third sample event. Laboratory blank contamination with SVOCs occurred during organic sample analyses of all the three events. Reported detections of the analytes detected in the organic sample, less than five times the level in the associated blank, have been requalified as non-detects and flagged 'UB'.

Following target furans were detected in the laboratory blanks associated with the first round of samples: tetra CDF and hexa CDF. Reported detections of these analytes, less than five times the level in the associated blank, have been requalified as non-detects and flagged 'UB'. A detailed Quality Assurance Report is presented in Appendix B.

Table 3 Comparison of Pollutant Daily Maximum Concentration to Calculated TexTox Daily Maximum Concentration
Patrick Bayou Pollutant Source Study - Deer Park, TX

OUTFALL	DESCRIPTION	Unit	Pollutant							
			Copper	Lead	Mercury	Nickel	Zinc	Arochlor 1248	Hexachloro-benzene	Total CDD/CDF Equivalents*
OCCIDENTAL CHEMICAL CORPORATION										
	Daily maximum concentration	µg/L	13.9	4.20	0.035	7.3	49	0.0169	0.0036	4.774
INTAKE	TSWQS for human health or Aquatic life	µg/L	4.37**	3.85**	0.025	13.2**	89**	0.0009*	0.0086	0.70
	Ratio above theTSWQS limit		3.2x	1.1x	1.4x	-	-	18.8x	-	6.8x
	Daily maximum concentration	µg/L	11.9	2.80	2.470	9.3	37	0.0155	0.0061	2.442
001	TexTox daily maximum concentration	µg/L	61.0	344.79	1.808	313.0	539	0.0651	0.6218	50.6152
	Ratio above the TEXTOX limit		-	-	1.4x	-	-	-	-	-
	Daily maximum concentration	µg/L	19.3	3.34	0.065	7.9	47	0.0180	0.0094	8.479
002	TexTox daily maximum concentration	µg/L	10.2	29.98	0.079	27.2	176	0.0028	0.0270	2.201
	Ratio above the TEXTOX limit		1.9x	-	-	-	-	6.4x	-	3.85x
	Daily maximum concentration	µg/L	12.1	3.53	0.028	6.7	36	0.0147	0.0046	nd
003	TexTox daily maximum concentration	µg/L	19.9	119.93	0.657	108.9	176	0.0237	0.2261	18.406
	Ratio above the TEXTOX limit		-	-	-	-	-	-	-	-
	Daily maximum concentration	µg/L	29.5	1.79	0.190	142.0	204	nd	0.3190	2.152
005	TexTox daily maximum concentration	µg/L	61.0	344.79	1.808	313.0	539	0.0651	0.6218	50.615
	Ratio above the TEXTOX limit		-	-	-	-	-	-	-	-
LUBRIZOL CORPORATION										
	Daily maximum concentration	µg/L	1.5	4.77	0.012	48.9	2 1	0.0176	nd	nd
001	TexTox daily maximum concentration	µg/L	28.2	88.98	0.314	80.8	249	0.1130	0.1081	8.803
	Ratio above the TEXTOX limit		-	-	-	-	1.01x	-	-	-
SHELL REFINERY & CHEMICAL										
	Daily maximum concentration	µg/L	9.6	2.40	0.054	15.2	40	nd	0.0016	0.230
R001	TexTox daily maximum concentration	µg/L	41.6	172.40	0.803	156.5	367	0.0289	0.2764	22.496
	Ratio above the TEXTOX limit		-	-	-	-	-	-	-	-
	Daily maximum concentration	µg/L	2.2	4.07	0.092	16.7	22	0.0166	nd	nd
COO1	TexTox daily maximum concentration	µg/L	61.0	344.79	1.808	313.0	539	0.0651	0.6218	50.615
	Ratio above the TEXTOX limit		-	-	-	-	-	-	-	-
DEER PARK AREA										
DEER	Daily maximum concentration	µg/L	2.5	2.10	0.011	3.5	35	0.0091	nd	nd
PARK	TexTox daily maximum concentration	µg/L	11.6	34.05	0.093	30.9	170	0.0033	0.0319	2.596
	Ratio above the TEXTOX limit		-	-	-	-	-	2.8x	-	-

Notes:

* Criteria calculated as the sum of seven PCB cogeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016

** Indicates that the criteria for spedific parameter is the dissolved portion in water

Total CDD/CDF equivalant concentrations are expressed in pg/L.

Maximum daily concentration = Maximum concentration from the set of three daily analyses.

TEXTOX maximum daily concentration = The lowest daily maximum concentration of the human health or aquatic life toxic limits.

Ratio above the TexTox limit = How many times is the daily maximum concentration higher than the TEXTOX daily maximum concentration.

nd Not detected.

Table 5 Calculated Mass Loadings for the Selected Parameters for the March Sampling Event

Patrick Bayou Pollutant Source Study - Deer Park, Texas

Location	Outfall	PARAMETER																
		Flow	Copper		Lead		Mercury		Nickel		Zinc		Arochlor 1248		Hexachlorobenzene		Total CDD/CDF equivalents	
		MGD	µg/L	lb/day	µg/L	lb/day	µg/L	lb/day	µg/L	lb/day	µg/L	lb/day	µg/L	lb/day	µg/L	lb/day	pg/L	lb/day
Occidental	001	4.295	5.8	0.208	2.18	0.078	1.63	0.0584	5.4	0.1934	31.4	1.125	0.0155	0.0006	0.0048	0.0002	2.442	8.7E-08
Chemical	002	59.75	3.9	1.943	3.34	1.664	0.065	0.0324	4.3	2.1428	24.7	12.308	0.0180	0.0090	0.0094	0.0047	8.479	3.0E-07
Corporation	003	5.105	4.0	0.170	3.53	0.150	0.028	0.0012	3.9	0.1660	21.9	0.932	0.0147	0.0006	0.0046	0.0002	nd	-
	005	0.529	22.9	0.101	0.51	0.002	0.19	0.0008	27.4	0.1209	204	0.900	nd	-	0.3190	0.0014	2.152	7.7E-08
Lubrizol Corporation	001	0.951	<2.0	-	<2.0	-	<0.01	-	42.9	0.3402	206	1.633	0.0176	0.0001	nd	-	nd	-
Shell Oil Company																		
Shell Refinery	R001	0.854	9.6	0.068	1.99	0.014	0.044	0.0003	13.9	0.0990	32.4	0.231	nd	-	nd	-	0.230	1.6E-09
Shell Chemical	C001	6.042	2.2	0.111	<1.0	-	0.092	0.0046	12.2	0.6148	12.6	0.635	0.0166	0.0008	nd	-	nd	-

Note: nd Not detected.

Dash indicates that the parameter was not calculable.

Parameter	Units	Intake				Shell Oil Company					Deer Park Area		
						Refinery, R-001		Chemical, C-001					
		Max	Average	CV	Ma	Average	CV	Max	Average	CV	Max	Average	CV
Acenaphthene	µg/L	0.0423	0.0318	34%	0.02	0.0483	40%	0.242	0.1232	93%	nd	nd	-
Acenaphthylene	µg/L	nd	nd	-	nd	0.0050	30%	nd	nd	-	nd	nd	-
Anthracene	µg/L	0.0183	0.0141	26%	0.00	0.0161	57%	0.0226	0.0137	63%	0.0217	0.0217	-
Benzo(k)fluoranthene	µg/L	0.0372	0.0211	76%	0.02	0.0141	51%	0.0144	0.0074	84%	0.0101	0.0101	-
Fluoranthene	µg/L	0.0281	0.0196	58%	0.02	0.0070	62%	nd	nd	-	0.0116	0.0116	-
Fluorene	µg/L	0.0106	0.0055	84%	nd	nd	-	0.1190	0.0460	138%	nd	nd	-
Naphthalene	µg/L	nd	nd	-	0.02	0.0145	35%	0.0496	0.0283	68%	0.0281	0.0281	-
Phenanthrene	µg/L	0.0161	0.0118	32%	0.02	0.0075	50%	0.0245	0.0140	69%	0.0225	0.0225	-
Pyrene	µg/L	0.0777	0.0573	38%	0.04	nd	-	0.3040	0.1624	76%	0.0074	0.0074	-
2-Methylnaphthalene	µg/L	0.0126	0.0083	47%	0.01	0.0107	20%	0.0492	0.0226	102%	nd	nd	-
Bis(2-ethylhexyl)phthalate	µg/L	1.65	0.64	136%	1.1	0.2908	105%	1.57	0.6035	139%	nd	nd	-
Hexachlorobenzene	µg/L	0.0036	0.0018	98%	0.00	0.0017	74%	nd	nd	-	nd	nd	-
Hexachlorobutadiene	µg/L	0.0041	0.0033	20%	0.00	nd	-	nd	nd	-	nd	nd	-
Hexachloroethane	µg/L	0.0035	0.0040	70%	0.10	nd	-	nd	nd	-	nd	nd	-
Arochlor 1248	µg/L	0.0169	0.0077	106%	0.01	nd	-	0.0166	0.0064	139%	0.0091	0.0091	-
Total CDD/CDF equivalents#	pg/L	4.774	1.782	146%	2.44	0.077	-	nd	nd	-	nd	nd	-
Barium, total recoverable	µg/L	140	106	28%	11	122	21%	57	47	35%	22	22	-
Chromium, total recoverable	µg/L	5.3	4.2	23%	8.9	7.8	18%	7.9	6.0	29%	nd	nd	-
Chromium, hexavalent **	µg/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	µg/L	13.9	7.8	69%	11.	8.0	17%	2.2	1.7	28%	2.5	2.5	-
Lead, total recoverable	µg/L	4.2	3.31	39%	2.8	2.11	12%	4.07	1.92	98%	2.1	2.1	-
Mercury, total recoverable	µg/L	0.035	0.023	45%	2.4	0.044	21%	0.092	0.034	148%	0.011	0.011	-
Nickel, total recoverable	µg/L	7.3	5.8	32%	9.3	14.6	4%	16.7	14.2	16%	3.5	3.5	-
Selenium, total recoverable	µg/L	3.43	1.88	74%	2.3	1.29	33%	0.38	0.30	23%	0.16	0.16	-
Vanadium, total recoverable	µg/L	16.5	13.7	20%	11.	16.5	21%	12.5	8.4	62%	2.8	2.8	-
Zinc, total recoverable	µg/L	49	32.9	43%	37	31.1	31%	21.7	16.1	30%	35	35	-
Hardness as $CaCO_3$	mg/L	2720	1418	89%	216	421	7%	172	169	2%	160	160	-
pH	s.u.	7.97	7.90	1%	7.3	8.26	6%	8.43	8.23	2%	7.5	7.5	-
Total Dissolved Solids	mg/L	16400	8180	98%	1800	5903	15%	14000	13233	6%	29	29	-
Total Organic Carbon	mg/L	10.1	8.8	19%	8.8	22.8	9%	57.2	37.7	52%	12.9	12.9	-
Total Suspended Solids	mg/L	73.4	45.9	85%	43	20.3	35%	32.9	15.6	97%	5.7	5.7	-

Notes:

Duplicate - Duplicate collected using separate parall
na not analyzed.
nd all samples were below the detection limit.
µg micrograms (10^{-6} grams)
pg picograms (10^{-12} grams)
Total CDD/CDF equivalents are calculated as zeros. Compounds used in calculation i

SECTION - 4
CONCLUSIONS

Based upon the data collected during the first three rounds, the overall assessment of each outfall is presented below.

OxyChem HSC Water Intake - Daily average concentrations of copper, arochlor 1248, and total CDD/CDF equivalents and daily maximum concentrations of lead and mercury were above the TSWQS limit as shown in tables 2 and 3. Continuation of sampling is recommended.

OxyChem 001 – Mercury is elevated compared to TEXTOX predictions and thus is a potential issue for a source study. The remaining parameters should continue to be sampled for the remaining three rounds.

OxyChem 002 – Mercury is elevated compared to TEXTOX predictions and thus is a potential issue for a source study. Intake concentrations of copper and CDD/CDF appear to be paralleling the trends observed in the outfall. However, the concentrations observed at this outfall are higher than concentrations seen at the HSC water intake. Continued sampling is recommended.

OxyChem 003 – Continued sampling of the outfall for the remaining three rounds is recommended.

OxyChem 005 – Continued sampling of the outfall for the remaining three rounds is recommended.

Lubrizol 001 – The three data point average nickel and zinc concentrations are slightly greater than the criteria established in the TEXTOX analysis. A review of the trend data and the historical data indicate that the first two rounds of sampling heavily influenced the results. Similarly the Arochlor 1248 analysis is influenced by the first round results. Continued sampling is warranted to assess the longer-term characterization of the outfall.

Shell Refinery R-001 - Continued sampling of the outfall for the remaining three rounds is recommended.

Shell Chemical C-001 - Continued sampling of the outfall for the remaining three rounds is recommended. The chemical plant discharge no longer discharges to Patrick Bayou and now discharges directly to the Houston Ship Channel upstream of Patrick Bayou.

City of Deer Park - Only one round of samples were collected from this location. Daily average and daily maximum concentration of arochlor 1248 observed at this location exceeded the TEXTOX modeled values by 5.7x and 2.8x, respectively. Continuation of sampling is recommended.

SAMPLE COLLECTION & HANDLING

EPA Method 1669 was used as guidance during sample collection and handling. Even though the method was developed for collection of samples for trace metals analysis, organic samples were also collected using the same "clean sampling techniques". The term "clean sampling techniques" refer to techniques that reduce or eliminate contamination in sample collection and handling and enable more accurate and precise measurement of trace metals. Following is a brief description of the sample set-up and collection procedures and the clean sampling techniques used during this study along with the list of apparatus and material used.

The sample team for this study consisted of two two-person teams. The first team was responsible for sites at OxyChem and the second team was responsible for sites at Lubrizol and Shell. However, during each of the sample rounds, both the teams worked on sample set-up and collection at outfall 001 at OxyChem to establish the standard procedures to be followed by both the teams at all the other sample locations. The "clean hands" and "dirty hands" technique, as described in EPA Method 1669, was used during sample set-up, collection, and aliquoting.

SAMPLE COLLECTION

Sampling Apparatus and Materials

Following is a brief list of apparatus and materials used for sampling during this study:

- Sample bottles - Pre cleaned glass amber bottles from I-CHEM were used for organic sample collection. Pre-cleaned composite sample container was provided by TERL for metals sample collection.
- Automatic samplers - American sigma 800, American Sigma 1200, NCON Scout-III, and Master Flex composite samplers were used during this study. All these samplers used peristaltic pumps to pump the sample. These pumps do not require cleaning as the sample never touches the pump. However, some of these samplers contain metal heads and surfaces. Touching these metal heads or surfaces necessiates changing of gloves before handling the sample apparatus.
- Tubing - Styrene/ethylene/butylene/silicone (SEBS) tubing and Tygon tubing pre-cleaned by TERL.
- Tubing connectors - Appropriately sized PVC or fluoropolymer barbed straight connectors pre-cleaned by TERL and nylon cable ties. Used to connect multiple lengths of tubing.
- Gloves - Various lengths of clean, powder free polyethylene or latex gloves

- "Clean hands" holds the pump tubing in place and "dirty hands" installs the cover back on the pump head.
- Both "clean hands" and "dirty hands" change gloves.
- "Dirty hands" program the sampler while "clean hands" collects the sample into a graduated cylinder. "Clean hands" makes a small hole at the end of the zip lock bag to collect the sample into the graduated cylinder there by minimizing the exposure to the atmosphere.
- "Dirty hands" places the composite sample container (along with the storage bag) inside the cooler.
- "Clean hands" removes the lid on the composite sample container and places in a zip-lock bag then secures discharge end of the tubing in the composite sample container. All this work is done inside the sample container's storage bag to minimize sample containers exposure to air-borne contaminants. Zip-lock bags at the discharge end of the tubing is removed at this time and zip-lock bag with sample container's lid will be left in the storage bag. The discharge end is secured approximately within an inch to two inches from the top of the container to avoid sample tubing from contaminating the sample, if sample overflows the container.
- "Dirty hands" will assist the "clean hands" in closing the storage bag.
- Both "dirty hands" and "clean hands" places ice in the cooler before placing the lid.
- "Dirty hands" will start the sampler.

Collection

Automatic samplers were programmed to sample every 15 minutes for 24 hours. However, due to the sample holding time restrictions some of the samples were collected before the 24-hour sample period was finished. "Clean hands" and "dirty hands" techniques were followed during the sample collection and aliquoting. Following is a brief description of these procedures:

"Clean hands" and "Dirty hands" Procedure for Sample Collection

- Sample team brings a cooler with ice for the composite sample containers to each location.
- Both "Clean hands" and "dirty hands" put on two pairs of gloves each.
- "Dirty hands" removes the lid on cooler with the composite sampler and opens the sample containers storage bag.
- "Clean hands" reaches into the storage bag and removes the tubing and firmly secures the cap on the sample container and closes the storage bag.
- "Dirty hands" opens the cooler with ice while "clean hands" places the sample container along with the storage bag on ice in the cooler.
- Both "clean hands" and "dirty hands" now remove all the sample equipment from site and leave for the next location.

hand - Dirty hand" technique, as described in EPA Method 1669, was used in sample set-up and collection.

In this technique, one member of the two-person sampling team is designated as "dirty hands", the second member is designated as "clean hands." All activities involving contact with the sample bottle are handled by the individual designated as "clean hands". "Dirty hands" is responsible for all the other activities that do not involve direct contact with the sample.

Automatic samplers were programmed to sample every 15 minutes for 24 hours. However, due to the sample holding time restrictions some of the samples were collected before the 24-hour sample period was finished. Coolers with the composite samples were brought to the OxyChem's wastewater treatment plant laboratory for aliquoting. Aliquoting was performed in a clean environment at the laboratory. Dr. Paul Booth from TERL performed the aliquoting. Hair cap, dust mask, and tyvek® suit were worn for aliquoting to minimize contamination. Gloves were changed for each locations and also when ever surfaces other than sample containers were touched.

QUALITY ASSURANCE SUMMARY REPORT FOR AQUEOUS SAMPLES COLLECTED DURING THE PATRICK BAYOU POLLUTANT SOURCE STUDY

INTRODUCTION

As part of the Patrick Bayou pollutant source study, three sampling events were conducted. The sampling events were conducted between March and August 1998. All work was performed in accordance with the Water Sampling Protocol. A Quality Assurance Project Plan (QAPP) was also prepared and approved to ensure generation of legally defensible data.

A total of approximately 28 aqueous samples, and associated field quality control samples were collected during the sampling events. The field quality control samples collected included the following types: matrix spikes/matrix spike duplicates (MS/MSD), and field duplicates. Samples were analyzed for one or more of the following parameters: semivolatile organics (SVOCs), dioxin/furans, metals, alkalinity, total dissolved solids, total suspended solids and total organic carbon (TOC). The samples were analyzed by Wright State University of Dayton, Ohio and the Trace Element Research Center at Texas A&M University using the USEPA-approved analytical methods specified in the QAPP.

This Quality Assurance (QA) summary report presents a summary and assessment of the analytical data generated for the sampling event. All data submitted by the laboratory have been evaluated using the quality assurance objectives and the data validation procedures described in the QAPP.

This report addresses only those problems affecting the usability of the data. A discussion of data validation qualifiers (flags) applied to the data and reasons for the qualifier are also presented. A glossary of the data validation qualifiers is presented in Attachment 1.

were performed using EPA method SW6010/7000 series and the wet chemistry parameters were analyzed using the EPA approved methods described in the QAPjP.

No major QA/QC problems were found during validation of the data submitted by the laboratory. No reported results have been qualified as unusable. Minor QA/QC problems leading to qualification of data included: laboratory blank contamination. Specifically, the laboratory blanks associated with the SVOC and dioxin/furan analyses contained target analytes at levels above the detection limits. Details regarding the samples and analytes affected are provided below.

Semivolatile Organics (SVOCs)

- The following target SVOCs were detected in the laboratory blanks associated with the samples: anthracene, arochlor 1248, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene. Reported detections of these analytes less than five times (ten times for phthalate) the level in the associated blank have been requalified as nondetects and flagged 'UB'.

Dioxin/Furans

- The following target furans were detected in the laboratory blanks associated with the samples: tetra CDF and hexa CDF. Reported detections of these analytes less than five times the level in the associated blank have been requalified as nondetects and flagged 'UB'.

May 1998 Sampling Event

Nine aqueous samples and associated field quality control samples were collected during the May 1998 sampling event. The samples were analyzed for selected SVOCs, dioxin/furans, selected metals, alkalinity, total suspended solids (TSS), total dissolved solids (TDS) and total organic carbon (TOC).

Analyses for SVOCs were performed using modified EPA method SW8270, analyses for dioxin/furans were performed using EPA method 1613, analyses for metals

contained target analytes at levels above the detection limits. Details regarding the samples and analytes affected are provided below.

Semivolatile Organics (SVOCs)

- SVOC target analytes bis(2-ethylhexyl)phthalate and hexachloroethane were detected in the laboratory blanks associated with the samples. Reported detections of these analytes in the samples, less than five (ten for the phthalate) times the level in the blanks have been requalified as nondetects and flagged 'UB'.

- SVOC surrogate outliers were reported for samples 001 and 001DUP. Reported results for these samples have been qualified as estimated and flagged 'J'/'UJ'.

APPENDIX C

Table C.2 - Comparision of TEXTOX Model Limits to OxyChem Outfall 001 Sample Results
Patrick Bayou Pollutant Source Study - Deer Park, Texas

		TEXTOX				Occidental Chemical Corporation					
		Human Health Toxic Limits		Aquatic Life Toxic Limits		001			001 - Duplicate		
Parameter	Units	Daily Avg.	Daily Max.	Daily Avg.	Daily Max.	5-Mar-98	20-May-98	13-Aug-98	5-Mar-98	20-May-98	13-Aug-98
Acenaphthene	µg/L					0.0260	0.0146	< 0.021 UJ	0.0659	< 0.0140	< 0.052 UJ
Acenaphthylene	µg/L					< 0.009	< 0.007	< 0.007 UJ	< 0.005	< 0.002	< 0.021 UJ
Anthracene	µg/L					0.0100 UB	0.0082	< 0.011 UJ	0.0116 UB	< 0.0060	< 0.020 UJ
Benzo(k)fluoranthene	µg/L					0.0204	0.0106 UB	0.0246 J	0.0182	0.0100 UB	0.0234 J
Fluoranthene	µg/L					0.0169 UB	0.0141 UB	0.0277 J	0.0236	0.0145 UB	0.0210 J
Fluorene	µg/L					0.0111 UB	0.0021 UB	< 0.010 UJ	0.0114 UB	0.0048 UB	< 0.0250 UJ
Naphthalene	µg/L					0.0188 UB	0.0187 UB	0.0268 J	0.0293	0.0164 UB	0.0494 J
Phenanthrene	µg/L			12.0736	25.5435	0.0190 UB	0.0230	< 0.010 UJ	0.0148 UB	0.0182	< 0.019 UJ
Pyrene	µg/L					0.0466	0.0252 UB	0.0338 J	0.0560	0.0212 UB	0.0335 J
2-Methylnaphthalene	µg/L					< 0.0040	0.0134	< 0.022 UJ	0.0111	0.0080	< 0.015 UJ
Bis(2-ethylhexyl)phthalate	µg/L					1.12	0.311 UB	0.0862 UB	0.46 UB	0.142 UB	0.0718 UB
Hexachlorobenzene	µg/L	0.2939	0.6218			0.0048	0.0041	0.0061 J	0.0096	0.0038	0.0061 J
Hexachlorobutadiene	µg/L	255.6477	540.8601			< 0.009	0.0077	< 0.001 UJ	< 0.009	0.004	0.0014 J
Hexachloroethane	µg/L	2142.9292	4533.6802			0.0146	0.104	0.0143 UB	0.0076	0.0849	0.0091 UB
Aroclor 1248	µg/L	0.0308	0.0651	0.3363	0.7144	0.0155	0.0048	0.0041 J	0.0102 UB	0.0039	< 0.013 UJ
Total CDDs	pg/L					255	95.7	89.7	459	147	112
Total CDDs/CDFs	pg/L					291	129	130	498	192	153
Total CDD/CDF equivalents#	pg/L	17.5000^	50.6152^			2.442	nd	0.999	0.289	nd	0.881
Tetra CDDs	pg/L					3.97	< 2.09	< 2.00	< 0.81	< 2.26	< 1.21
Penta CDDs	pg/L					< 2.90	< 2.48	< 0.31	< 2.47	< 2.04	< 0.39
Hexa CDDs	pg/L					< 1.75	< 1.62	< 1.37	3.29	< 1.81	3.59
Hepta CDDs	pg/L					< 2.1	5.89	12.3	35.6	18.3	14.0
Octa CDD	pg/L					251	89.8	77.4	420	129	94.4
2378 TCDD (equiv factor = 1)	pg/L					1.88	< 2.09	< 2.00	< 1.52	< 2.26	< 1.21
12378 PeCDD (equiv factor = 0.5)	pg/L					< 2.90	< 2.48	< 0.31	< 2.47	< 2.04	< 0.39
123478 HxCDD (equiv factor = 0.1)	pg/L					< 2.05	< 1.88	< 1.41	< 2.89	< 2.02	< 1.81
123678 HxCDD (equiv factor = 0.1)	pg/L					< 1.53	< 1.38	< 1.29	< 2.28	< 1.59	< 1.53
123789 HxCDD (equiv factor = 0.1)	pg/L					< 1.74	< 1.68	< 1.42	< 2.54	< 1.88	< 1.75
1234678 HpCDD	pg/L					< 6.98	5.89	5.15	13.2	7.76	4.40
Total CDFs	pg/L					35.9	33.1	40.4	38.4	44.7	41.1
Tetra CDFs	pg/L					4.80 UB	< 1.42	19.5	3.87	< 1.47	22.0
Penta CDFs	pg/L					3.05	< 1.40	< 0.67	< 0.98	< 1.78	< 0.81
Hexa CDFs	pg/L					3.70 UB	< 1.01	< 0.37	1.12	< 0.78	< 0.82
Hepta CDFs	pg/L					< 2.01	< 3.79	< 1.86	< 1.77	< 0.96	< 1.80
Octa CDF	pg/L					24.3	33.1	20.9	33.5	44.7	19.1
2378 TCDF (equiv factor = 0.1)	pg/L					3.25	< 1.42	9.99	2.89	< 1.79	8.81
12378 PeCDF (equiv factor = 0.05)	pg/L					< 1.29	< 1.35	< 0.67	< 0.89	< 1.71	< 0.76
23478 PeCDF (equiv factor = 0.5)	pg/L					< 1.58	< 1.46	< 0.68	< 1.09	< 1.85	< 0.85
123478 HxCDF (equiv factor = 0.1)	pg/L					2.37	< 0.97	< 0.35	< 1.34	< 0.74	< 0.79
123678 HxCDF (equiv factor = 0.1)	pg/L					< 1.01	< 0.83	< 0.32	< 0.62	< 0.68	< 0.71
234678 HxCDF (equiv factor = 0.1)	pg/L					< 1.11	< 1.02	< 0.38	< 0.70	< 0.81	< 0.85
123789 HxCDF (equiv factor = 0.1)	pg/L					< 1.34	< 1.32	< 0.44	< 0.81	< 0.95	< 1.00
1234678 HpCDF	pg/L					< 3.71	< 3.34	< 1.63	< 5.46	< 3.16	< 1.63
1234789 HpCDF	pg/L					< 2.25	< 4.37	< 2.16	< 1.93	< 1.10	< 2.02
Barium, total recoverable	µg/L	na	na			67	92	110	66	89	110
Chromium, total recoverable	µg/L	na	na			7.5	8.9	6.3	7.2	9.1	5.8
Chromium, hexavalent **	µg/L			560.4375	1185.6875	na	na	na	na	na	na
Copper, total recoverable	µg/L			28.8527	61.0421	5.8	5.5	11.9	5.8	5.5	13.3
Lead, total recoverable	µg/L	341.6405	722.7903	162.9722	344.7915	2.18	2.80	1.8	1.82	2.69	1.7
Mercury, total recoverable	µg/L	0.8544	1.8077	3.2928	6.9664	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Nickel, total recoverable	µg/L			147.9555	313.0215	5.4	9.3	6.9	5.5	10.3	7.3
Selenium, total recoverable	µg/L	na	na	884.3520	1870.9760	0.55	2.37	1.18	0.58	2.50	1.21
Vanadium, total recoverable	µg/L					9.5	9.3	11.3	7.8	6.4	12.9
Zinc, total recoverable	µg/L			254.7308	538.9203	31.4	26.2	37	32	28.0	43
Hardness (as $CaCO_3$)	mg/L					160	1020	2160	160	980	2180
pH	s.u.					na	na	7.3	na	7.90	7.7
Total Dissolved Solids	mg/L					7510	12100	18000	7510	12100	17900
Total Organic Carbon	mg/L					6.3	5.92	8.81	6.30	6.10	8.2
Total Suspended Solids	mg/L					43	12.4	8.0	43	11.7	8.3

TSWQS Texas Surface Water Quality Standards (shaded values are the EPA screening values, not actual c
Duplicate Duplicate collected using *separate parallel sampler setups, with the less than 6 inches separation bet*
µg micrograms (10^{-6} grams)
pg picograms (10^{-12} grams)
UB Contaminant also detected in associated laboratory blank, and therefore, should be considered not
UJ Contaminant was not detected, but because of QA/QC non conformance the result was qualified a
J Contaminant was detected but because of QA/QC non conformance the result was qualified as an
• Indicates that the criteria for a specific parameter is the dissolved portion in water.
** Not analyzed since chromium results were all less than 50 µg/L.
*** Criteria calculated as the sum of seven PCB congeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016

Total CDD/CDF equivalents are calculated using the equivalency factors from TSWQS. 'nd' s were calculated as zeros. Compounds used in calculation include 2378 TCDD, 12378 PeCDD, 2378 HxCDD's, 2378 TCDF, 12378 PeCDF, 23478 PeCDF, and 2378 HxCDF's.
na Not applicable/analyzed.
nd Not detected.
† Human life protection standard was taken from the TSWQS for "salt water fish only."
†† Aquatic life protection standard was taken from the TSWQS for "marine chronic."
^ Limit expressed as annual average and daily max.
Values in the shaded areas exceeded the TEXTOX modeled criteria for either human health or aquatic life protection.

Table C.4 - Comparision of TEXTOX Model Limits to OxyChem Outfall 003 Sample Results
Patrick Bayou Pollutant Source Study - Deer Park, Texas

		TEXTOX				Occidental Chemical Corporation		
		Human Health Toxic Limits		Aquatic Life Toxic Limits		003		
Parameter	Units	Daily Avg.	Daily Max.	Daily Avg.	Daily Max.	5-Mar-98	20-May-98	13-Aug-98
Acenaphthene	µg/L					0.0703	< 0.0540	< 0.014
Acenaphthylene	µg/L					< 0.0040	< 0.0150	< 0.006
Anthracene	µg/L					0.0119 UB	0.0197	< 0.009
Benzo(k)fluoranthene	µg/L					0.0318	0.0103 UB	0.0250
Fluoranthene	µg/L					0.0216	0.0198 UB	0.0264
Fluorene	µg/L					0.0327 UB	0.0369 UB	< 0.006
Naphthalene	µg/L					0.0090 UB	0.0285 UB	0.0163
Phenanthrene	µg/L			3.9370	8.3294	0.0119 UB	0.0190	0.0111
Pyrene	µg/L					0.0727	0.0397	0.0354
2-Methylnaphthalene	µg/L					0.0077	0.0074	< 0.003
Bis(2-ethylhexyl)phthalate	µg/L					0.619	0.138 UB	0.336 UB
Hexachlorobenzene	µg/L	0.1069	0.2261			0.0046	0.0028	0.0026
Hexachlorobutadiene	µg/L	92.9628	196.6764			0.029	0.0123	0.0087
Hexachloroethane	µg/L	779.2469	1648.6110			0.0028	0.0030	< 0.005
Arochlor 1248	µg/L	0.0112	0.0237	0.1170	0.2474	[redacted]	0.0044	0.0020
Total CDDs	pg/L					518	148	74.1
Total CDDs/CDFs	pg/L					564	320	109
Total CDD/CDF equivalents#	pg/L	6.3636^	18.4055^			nd	nd	nd
Tetra CDDs	pg/L					< 0.74	< 2.28	< 0.740
Penta CDDs	pg/L					< 1.63	< 5.54	< 0.480
Hexa CDDs	pg/L					< 1.79	< 4.53	< 1.110
Hepta CDDs	pg/L					24.90	11.30	11.5
Octa CDD	pg/L					493	137	62.6
2378 TCDD (equiv factor = 1)	pg/L					< 1.14	< 2.28	< 2.57
12378 PeCDD (equiv factor = 0.5)	pg/L					< 1.63	< 5.54	< 0.48
123478 HxCDD (equiv factor = 0.1)	pg/L					< 2.01	< 5.26	< 1.15
123678 HxCDD (equiv factor = 0.1)	pg/L					< 1.62	< 3.86	< 1.03
123789 HxCDD (equiv factor = 0.1)	pg/L					< 1.79	< 4.68	< 1.15
1234678 HpCDD	pg/L					< 13.20	< 4.67	3.76
Total CDFs	pg/L					46.2	172.0	34.6
Tetra CDFs	pg/L					1.58 UB	< 1.10	1.35
Penta CDFs	pg/L					< 1.46	< 3.77	< 0.28
Hexa CDFs	pg/L					< 0.56	< 1.30	< 0.28
Hepta CDFs	pg/L					< 1.56	< 2.49	< 0.70
Octa CDF	pg/L					44.7	172	33.2
2378 TCDF (equiv factor = 0.1)	pg/L					< 2.14	< 1.10	< 2.41
12378 PeCDF (equiv factor = 0.05)	pg/L					< 1.36	< 3.58	< 0.27
23478 PeCDF (equiv factor = 0.5)	pg/L					< 1.57	< 3.97	< 0.29
123478 HxCDF (equiv factor = 0.1)	pg/L					< 0.95	< 1.23	< 0.28
123678 HxCDF (equiv factor = 0.1)	pg/L					< 0.51	< 1.04	< 0.23
234678 HxCDF (equiv factor = 0.1)	pg/L					< 0.54	< 1.34	< 0.29
123789 HxCDF (equiv factor = 0.1)	pg/L					< 0.64	< 1.77	< 0.33
1234678 HpCDF	pg/L					< 4.95	< 3.07	< 0.64
1234789 HpCDF	pg/L					< 1.70	< 4.58	< 0.78
Barium, total recoverable	µg/L	na	na			79	96	109
Chromium, total recoverable	µg/L	na	na			3.6	3.4	2.7
Chromium, hexavalent **	µg/L			194.9348	412.4131	na	na	na
Copper, total recoverable	µg/L			9.4085	19.9050	4.0	6.6	[redacted]
Lead, total recoverable	µg/L	124.2329	262.8329	56.6860	119.9275	3.53	1.92	1.0
Mercury, total recoverable	µg/L	0.3107	0.6573	1.0737	2.2717	0.028	0.025	0.026
Nickel, total recoverable	µg/L			51.4628	108.8771	3.9	6.7	5.5
Selenium, total recoverable	µg/L	na	na	288.3756	610.1008	0.64	1.66	1.16
Vanadium, total recoverable	µg/L					7.3	10.4	9.9
Zinc, total recoverable	µg/L			83.0644	175.7349	21.9	27.2	36
Hardness (as $CaCO_3$)	mg/L					188	1280	2280
pH	s.u.					7.67	7.80	7.7
Total Dissolved Solids	mg/L					490	7400	14000
Total Organic Carbon	mg/L					8.40	6.60	10.3
Total Suspended Solids	mg/L					65.3	16.7	9.9

Notes: TSWQS - Texas Surface Water Quality Standards (shaded values are the EPA screening values, not actual criteria).

µg micrograms (10^{-6} grams)

pg picograms (10^{-12} grams)

UB Contaminant also detected in associated laboratory blank, and therefore, should be considered not detected.

UJ Contaminant was not detected, but because of QA/QC non conformance the result was qualified as an estimate.

J Contaminant was detected, but because of QA/QC non conformance the result was qualified as an estimate.

* Indicates that the criteria for a specific parameter is the dissolved portion in water.

** Not analyzed since chromium results were all less than 50 µg/L.

*** Criteria calculated as the sum of seven PCB congeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016.

Total CDD/CDF equivalents are calculated using the equivalency factors from TSWQS. Non-detect results werecalculated as zeros. Compounds used in calculation include 2378 TCDD, 12378 PeCDD, 2378 HxCDD's, 2378 TCDF, 12378 PeCDF, 23478 PeCDF, and 2378 HxCDF's.

na Not applicable/analyzed.

nd Not detected.

† Human life protection standard was taken from the Texas Surface Water Quality Standard for "salt water fish only."

†† Aquatic life protection standard was taken from the Texas Surface Water Quality Standard for "marine chronic."

^ Limit expressed as annual average and daily max.

Values in the shaded areas exceeded the TEXTOX modeled criteria for either human health or aquatic life protection.

Table C.6 - Comparision of TEXTOX Model Limits to Lubrizol Outfall 001 Sample Results
Patrick Bayou Pollutant Source Study - Deer Park, Texas

		TEXTOX				Lubrizol Corporation		
		Human Health Toxic Limits		Aquatic Life Toxic Limits		001		
Parameter	Units	Daily Avg.	Daily Max.	Daily Avg.	Daily Max.	5-Mar-98	20-May-98	13-Aug-98
Acenaphthene	µg/L					0.7760	< 0.0410	< 0.088
Acenaphthylene	µg/L					< 0.0410	< 0.0170	< 0.034
Anthracene	µg/L					< 0.0120	0.0385	< 0.017
Benzo(k)fluoranthene	µg/L					0.0028 UB	0.0069 UB	0.0789
Fluoranthene	µg/L					< 0.0020	< 0.0070	0.0348
Fluorene	µg/L					0.0896 UB	< 0.0110	< 0.036
Naphthalene	µg/L					< 0.0050	0.0293 UB	0.0279
Phenanthrene	µg/L			5.5724	11.7893	< 0.0120	0.0357	< 0.016
Pyrene	µg/L					0.0075 UB	< 0.0060	0.0347
2-Methylnaphthalene	µg/L					0.0591	< 0.0140	0.0939
Bis(2-ethylhexyl)phthalate	µg/L					0.207 UB	0.133 UB	0.196 UB
Hexachlorobenzene	µg/L	0.0511	0.1081			< 0.0050	0.0000	< 0.005
Hexachlorobutadiene	µg/L	44.4605	94.0626			< 0.009	0.0000	< 0.001
Hexachloroethane	µg/L	372.6833	788.4661			< 0.0030	< 0.0010	< 0.003
Arochlor 1248	µg/L	0.0053	0.113	0.0868	0.1836	[redacted]	< 0.0020	< 0.005
Total CDDs	pg/L					nd	nd	nd
Total CDDs/CDFs	pg/L					nd	nd	9.07
Total CDD/CDF equivalents#	pg/L	3.0435^	8.8027^			nd	nd	nd
Tetra CDDs	pg/L					< 0.79	< 1.22	< 1.45
Penta CDDs	pg/L					< 1.82	< 2.80	< 0.86
Hexa CDDs	pg/L					< 1.23	< 2.23	< 1.41
Hepta CDDs	pg/L					< 1.00	< 1.13	< 0.97
Octa CDD	pg/L					< 4.94	< 3.34	< 0.95
2378 TCDD (equiv factor = 1)	pg/L					< 0.79	< 1.22	< 1.45
12378 PeCDD (equiv factor = 0.5)	pg/L					< 1.82	< 2.80	< 0.86
123478 HxCDD (equiv factor = 0.1)	pg/L					< 1.29	< 2.65	< 1.50
123678 HxCDD (equiv factor = 0.1)	pg/L					< 1.18	< 1.87	< 1.29
123789 HxCDD (equiv factor = 0.1)	pg/L					< 1.24	< 2.30	< 1.46
1234678 HpCDD	pg/L					< 1.00	< 1.13	< 0.97
Total CDFs	pg/L					nd	nd	9.07
Tetra CDFs	pg/L					< 0.21	< 0.62	< 0.75
Penta CDFs	pg/L					< 0.65	< 2.02	< 0.96
Hexa CDFs	pg/L					< 0.59	< 0.56	< 0.35
Hepta CDFs	pg/L					< 1.04	< 1.77	< 1.14
Octa CDF	pg/L					< 2.22	< 3.26	9.07
2378 TCDF (equiv factor = 0.1)	pg/L					< 0.35	< 0.62	< 0.75
12378 PeCDF (equiv factor = 0.05)	pg/L					< 0.60	< 1.95	< 0.94
23478 PeCDF (equiv factor = 0.5)	pg/L					< 0.72	< 2.09	< 0.99
123478 HxCDF (equiv factor = 0.1)	pg/L					< 0.59	< 0.55	< 2.61
123678 HxCDF (equiv factor = 0.1)	pg/L					< 0.54	< 0.48	< 0.29
234678 HxCDF (equiv factor = 0.1)	pg/L					< 0.58	< 0.57	< 0.36
123789 HxCDF (equiv factor = 0.1)	pg/L					< 0.74	< 0.68	< 0.42
1234678 HpCDF	pg/L					< 0.96	< 1.61	< 14.5
1234789 HpCDF	pg/L					< 1.12	< 1.96	< 1.27
Barium, total recoverable	µg/L	na	na			736	1431	618
Chromium, total recoverable	µg/L	na	na			6.3	15.6	12.0
Chromium, hexavalent **	µg/L			144.6290	305.9839	na	na	na
Copper, total recoverable	µg/L			13.3166	28.1733	< 2.0	1.2	1.5
Lead, total recoverable	µg/L	59.4157	125.7027	42.0573	88.9784	< 2.0	4.77	3.4
Mercury, total recoverable	µg/L	0.1486	0.3144	1.5198	3.2153	< 0.01	0.012	< 0.01
Nickel, total recoverable	µg/L			38.1821	80.7797	[redacted]	[redacted]	24.4
Selenium, total recoverable	µg/L	na	na	393.3910	832.2762	0.27	0.22	0.30
Vanadium, total recoverable	µg/L					12.7	6.8	3.4
Zinc, total recoverable	µg/L			117.5681	248.7325	[redacted]	[redacted]	[redacted]
Hardness (as $CaCO_3$)	mg/L					5750	7150	1200
pH	s.u.					7.40	7.75	8.0
Total Dissolved Solids	mg/L					23800	38800	29200
Total Organic Carbon	mg/L					10.6	46.7	97.2
Total Suspended Solids	mg/L					36	208	7.9

Notes: TSWQS - Texas Surface Water Quality Standards (shaded values are the EPA screening values, not actual criteria).

µg micrograms (10^{-6} grams)

pg picograms (10^{-12} grams)

UB Contaminant also detected in associated laboratory blank, and therefore, should be considered not detected.

UJ Contaminant was not detected, but because of QA/QC non conformance the result was qualified as an estimate.

J Contaminant was detected, but because of QA/QC non conformance the result was qualified as an estimate.

* Indicates that the criteria for a specific parameter is the dissolved portion in water.

** *Not analyzed since chromium results were all less than 50 µg/L.*

*** Criteria calculated as the sum of seven PCB congeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016.

Total CDD/CDF equivalents are calculated using the equivalency factors from TSWQS. Non-detect results werecalculated as zeros. Compounds used in calculation include 2378 TCDD, 12378 PeCDD, 2378 HxCDD's, 2378 TCDF, 12378 PeCDF, 23478 PeCDF, and 2378 HxCDF's.

na Not applicable/analyzed.

nd Not detected.

† Human life protection standard was taken from the Texas Surface Water Quality Standard for "salt water fish only."

†† *Aquatic life protection standard was taken from the Texas Surface Water Quality Standard for "marine chronic."*

^ Limit expressed as annual average and daily max.

Values in the shaded areas exceeded the TEXTOX modeled criteria for either human health or aquatic life protection.

Table C.8 - Comparision of TEXTOX Model Limits to Shell Chemical Outfall C-001 Sample Results
Patrick Bayou Pollutant Source Study - Deer Park, Texas

Parameter	Units	TEXTOX Human Health Toxic Limits Daily Avg.	TEXTOX Human Health Toxic Limits Daily Max.	TEXTOX Aquatic Life Toxic Limits Daily Avg.	TEXTOX Aquatic Life Toxic Limits Daily Max.	Shell Chemical C-001 5-Mar-98	Shell Chemical C-001 20-May-98	Shell Chemical C-001 13-Aug-98
Acenaphthene	µg/L					0.242	0.113	< 0.029
Acenaphthylene	µg/L					< 0.042	< 0.031	< 0.033
Anthracene	µg/L					< 0.0110	0.0226	< 0.026
Benzo(k)fluoranthene	µg/L					0.0108 UB	0.0049 UB	0.0144
Fluoranthene	µg/L					< 0.0080	< 0.013	< 0.018
Fluorene	µg/L					0.1190	< 0.007	< 0.031
Naphthalene	µg/L					0.0258 UB	0.0445 UB	0.0496
Phenanthrene	µg/L			12.0736	25.5435	< 0.0110	0.0245	< 0.024
Pyrene	µg/L					0.304	0.0946	0.0886
2-Methylnaphthalene	µg/L					0.0492	< 0.019	< 0.018
Bis(2-ethylhexyl)phthalate	µg/L					1.57	0.0842 UB	0.397 UB
Hexachlorobenzene	µg/L	0.2939	0.6218			< 0.0050	< 0.001	< 0.006
Hexachlorobutadiene	µg/L	255.6477	540.8601			< 0.008	0.000	< 0.001
Hexachloroethane	µg/L	21.2.9292	4533.6802			< 0.0030	< 0.001	< 0.002
Arochlor 1248	µg/L	0.0308	0.0651	0.3363	0.7114	0.0166	< 0.002	< 0.003
Total CDDs	pg/L					2.49	22.7	nd
Total CDDs/CDFs	pg/L					51.30	165	11.5
Total CDD/CDF equivalents#	pg/L	17.5000^	50.6152^			nd	nd	nd
Tetra CDDs	pg/L					2.49	< 1.41	< 0.60
Penta CDDs	pg/L					< 2.07	< 3.29	< 1.38
Hexa CDDs	pg/L					< 1.06	< 2.68	< 1.32
Hepta CDDs	pg/L					< 0.97	< 2.39	< 0.99
Octa CDD	pg/L					< 12.40	22.7	< 1.37
2378 TCDD (equiv factor = 1)	pg/L					< 0.58	< 1.41	< 1.92
12378 PeCDD (equiv factor = 0.5)	pg/L					< 2.07	< 3.29	< 1.38
123478 HxCDD (equiv factor = 0.1)	pg/L					< 1.15	< 3.04	< 1.52
123678 HxCDD (equiv factor = 0.1)	pg/L					< 0.98	< 2.33	< 1.13
123789 HxCDD (equiv factor = 0.1)	pg/L					< 1.06	< 2.77	< 1.36
1234678 HpCDD	pg/L					< 2.58	< 2.39	< 0.99
Total CDFs	pg/L					48.8	142	11.5
Tetra CDFs	pg/L					< 0.30	< 0.68	< 0.31
Penta CDFs	pg/L					< 0.96	< 2.30	< 0.41
Hexa CDFs	pg/L					3.91 UB	12.4	< 0.51
Hepta CDFs	pg/L					< 1.84	43.0	< 0.94
Octa CDF	pg/L					44.9	86.9	11.5
2378 TCDF (equiv factor = 0.1)	pg/L					< 0.55	< 0.68	< 0.31
12378 PeCDF (equiv factor = 0.05)	pg/L					< 0.86	< 2.22	< 0.40
23478 PeCDF (equiv factor = 0.5)	pg/L					< 1.07	< 2.39	< 0.42
123478 HxCDF (equiv factor = 0.1)	pg/L					< 1.85	< 2.47	< 0.50
123678 HxCDF (equiv factor = 0.1)	pg/L					< 0.73	< 0.70	< 0.44
234678 HxCDF (equiv factor = 0.1)	pg/L					< 0.76	< 1.24	< 0.53
123789 HxCDF (equiv factor = 0.1)	pg/L					< 0.87	< 1.03	< 0.60
1234678 HpCDF	pg/L					< 20.20	32.2	< 8.95
1234789 HpCDF	pg/L					< 3.47	< 4.39	< 1.06
Barium, total recoverable	µg/L	na	na			28	55	57
Chromium, total recoverable	µg/L	na	na			5.4	7.9	4.6
Chromium, hexavalent **	µg/L			560.4375	1185.6875	na	na	na
Copper, total recoverable	µg/L			28.8527	61.0421	2.2	1.3	1.5
Lead, total recoverable	µg/L	341.6405	722.7903	162.9722	344.7915	< 1.0	4.07	1.2
Mercury, total recoverable	µg/L	0.8544	1.8077	3.2928	6.9664	0.092	< 0.01	< 0.01
Nickel, total recoverable	µg/L			147.9555	313.0215	12.2	16.7	13.7
Selenium, total recoverable	µg/L	na	na	884.3520	1870.9760	0.24	0.29	0.38
Vanadium, total recoverable	µg/L					< 5.0	12.5	10.2
Zinc, total recoverable	µg/L			254.7308	538.9203	12.6	21.7	14
Hardness (as $CaCO_3$)	mg/L					168	172	166
pH	s.u.					8.02	8.24	8.43
Total Dissolved Solids	mg/L					12500	13200	14000
Total Organic Carbon	mg/L					37.8	18.2	57.2
Total Suspended Solids	mg/L					8.8	32.9	5.0

Notes: TSWQS - Texas Surface Water Quality Standards (shaded values are the EPA screening values, not actual criteria).

µg micrograms (10^{-6} grams)

pg picograms (10^{-12} grams)

UB Contaminant also detected in associated laboratory blank, and therefore, should be considered not detected.

UJ Contaminant was not detected, but because of QA/QC non conformance the result was qualified as an estimate.

J Contaminant was detected, but because of QA/QC non conformance the result was qualified as an estimate.

* Indicates that the criteria for a specific parameter is the dissolved portion in water.

** Not analyzed since chromium results were all less than 50 µg/L.

*** Criteria calculated as the sum of seven PCB congeners 1242, 1254, 1221, 1232, 1248, 1260, and 1016.

Total CDD/CDF equivalents are calculated using the equivalency factors from TSWQS. Non-detect results werecalculated as zeros. Compounds used in calculation include 2378 TCDD, 12378 PeCDD, 2378 HxCDD's, 2378 TCDF, 12378 PeCDF, 23478 PeCDF, and 2378 HxCDF's.

na Not applicable/analyzed.

nd Not detected.

† Human life protection standard was taken from the Texas Surface Water Quality Standard for "salt water fish only."

†† Aquatic life protection standard was taken from the Texas Surface Water Quality Standard for "marine chronic."

^ Limit expressed as annual average and daily max.

Values in the shaded areas exceeded the TEXTOX modeled criteria for either human health or aquatic life protection.

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

October 19, 1998

Randy M. Palachek
Parsons Engineering Science, Inc.
8000 Centre Park Drive, Suite 200
Austin, Texas 78754-5140

RE: Patrick Bayou

Mr. Palachek:

This letter is response to your request for information about Patrick Bayou. Attached are Critical Conditions of permitted dischargers into Patrick Bayou. These conditions are current as of today.

If you need further assistance, you can contact Robert Ozment at 239-4588.

Sincerely,

Faith Hambleton

Faith Hambleton
Team Leader, Water Quality Assessments (MC-150)

FAH/rco

Enclosure

PATRICKS BAYOU POLLUTANT SOURCE STUDY

SCOPE OF WORK

I. PROJECT TITLE

An investigation of sources of bioaccumulative and toxic pollutants to Patricks Bayou.

II. PURPOSE AND OBJECTIVES

A. PURPOSE

The purpose is to determine the sources and amounts of bioaccumulative and toxic substances to Patricks Bayou.

B. OBJECTIVES

The objectives are for the facilities discharging to the waterbody to (a) compile effluent chemistry data for the last five years for pollutants of concern; (b) collect new effluent data on pollutants of concern over a six month period; (c) conduct a waste stream evaluation to determine the processes contributing the pollutants of concern; and (e) compile all data generated and analyze the results in a final report to be completed within one year of initiation.

III. BACKGROUND INFORMATION

Two recent studies collected data for toxic substances in water and sediment for Patricks Bayou. The first study (ENSR 1995), conducted by the City of Houston (through Consent Decree with EPA) found high concentrations of bioaccumulative contaminants in sediment, including PAHs, PCB 1248 and mercury. In addition, dioxins/furans in sediment were higher in Patricks Bayou than other portions of the Ship Channel system. Due to the contamination found in the first study, a second more detailed study of ambient water and sediment was conducted by TNRCC and EPA to verify and further delineate the contamination. This study found water column exceedances of human health water quality standards for mercury, copper, lead, and carbon tetrachloride. Elevated sediment concentrations of PAHs, PCB 1248, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, mercury, and several other heavy metals were found. (Funds were not available for analysis of dioxin). Both studies found significant ambient water and sediment toxicity in Patricks Bayou.

The data collected from these two studies indicate a relatively high risk to both aquatic life and human health from the standpoint of sediment and water column chemical-specific concentrations and toxicity. Because of the effluent-dominated nature of Patricks Bayou, and because of the observed spacial patterns in concentration, most of the pollutants found probably originate from point sources. Many of the pollutants are bioaccumulative and have the potential to accumulate in sediments and fish tissue within Patricks Bayou. They also have the potential to affect both the Houston Ship Channel and the upper portion of Galveston Bay. The existing fish consumption advisory is a testament of the far-reaching effects of dioxins and furans. For some pollutants data are available but

Parameters of Secondary Concern

Other heavy metals*
PAHs**

*Copper, zinc, hexavalent chromium, barium, lead, nickel, selenium, vanadium
**Benzo(k)fluoranthene, fluoranthene, pyrene, phenanthrene, acenapthene, acenapthylene, anthracene, fluorene, 2-methylnapthalene, napthalene

VI. SAMPLING PROCEDURES

Manual composite samples will be collected for process and other continuous discharges directly to, or influencing the bayou using ultra-clean techniques. In addition, grab samples will be collected for stormwater discharges to the bayou for significant rainfall events, i.e., resulting in discharge of stormwater outfalls for all participating facilities. Ultra-clean procedures should be used to avoid sample contamination, and standard preservation, handling, storage and chain of custody procedures should be followed, although a special emphasis should be placed on preventing contamination. Industries should also monitor discharge flow in connection with all effluent sampling. Flow should be expressed as MGD.

VII. SAMPLING SCHEDULE

The sampling for process outfalls should take place on approximately a monthly frequency over a six month period. Sampling for stormwater should take place three times over six months. Sampling of stormwater outfalls should take place during the first hour of discharge. Sampling of effluents for participating facilities should take place concurrently in a coordinated fashion.

VIII. SAMPLING POINTS

Sampling should be conducted on the following outfalls:

(a) Occidental Chemical (TX7412) 001-005 (process);
(b) Occidental Chemical (TX6335) 001 (process);
(c) Lubrizol (TX7048) 001 (process) and 002-007 (stormwater)
(c) Shell Oil (TX4871) 001 (cooling tower blowdown) and 002-004, 009 (stormwater); and
(d) Shell Chemical (TX4836) 001 (process) and 002 & 003 (stormwater).

The option is available to include other facilities/outfalls which influence water quality in Patricks Bayou.

IX. WASTE STREAM ANALYSIS

In addition to effluent sampling, the industrial participants should assess concentrated waste streams and or processes contributing the pollutants of concern. This may require chemical analysis of the various treatment plant components, and/or engineering studies. Results of these

factors contained in TNRCC (1994) and ENSR (1995). Calculation using both of these partitioning factors is recommended.

Dioxins and furans data should be presented as chemical concentrations for individual congeners as well as toxicity equivalence concentration (the sum of the toxicologically relavent congeners) (U.S. EPA 1989b).

XV. FINAL REPORT

A final report will be prepared within one year of initiating the study, and will include all data and evaluations. The report should list products manufactured or produced. The final report should also include a description of all actions taken with regard to investigating and controlling the pollutants of concern. The report should also include projected schedules for planned actions of this type. The draft final report will be submitted to EPA and TNRCC for review.

XVI. SCHEDULE AND DELIVERABLES

Deliverable:	Tentative Schedule:
Initial Meeting w/ EPA/TNRCC	June 27, 1995
Draft QAPP	August 15, 1995
Final QAPP	September 15, 1995
Monthly Sampling Complete	March 30, 1996
Quarterly Report	Quarterly
Interim Report	April 30, 1996
Waste Stream Analysis Complete	June 1, 1996
Draft Final Report	July 1, 1996
Final Report	August 1, 1996

Deliverables should be sent to the following agency contacts:

Philip Crocker (6W-QT)
U.S. EPA Region 6
1445 Ross Avenue
Dallas, TX 75202-2733

B.J. Lee, Ph.D.
Toxicity Eval. Team
TNRCC
P.O. Box 13087
Austin, TX 78711-3087

Linda Broach
TNRCC Houston Region
4150 Westheimer
Houston, TX 77027

XVII. LITERATURE CITED

ENSR. 1995. Houston Ship Channel toxicity study project report. ENSR Consulting and Engineering, Houston, TX. February 1995 Draft. Document number 1591-001-801.

TNRCC. 1994. Implementation of Texas Natural Resource Conservation Commission standards via permitting. Texas Natural Resource Conservation Commission, Austin, TX.

U.S. EPA 1989a. Method 1613: Tetra- Xthrough octa chlorinated dioxins and furans by isotope dilution. U.S. EPA, Office of Water Regulations and Standards. July 1989.

Table 1. Goals for parameter detection (all values in ug/L).

Parameter	Water Quality Standard	MQL Goal	(NPDES MQL)
Dioxins/Furans	0.0000007	0.0000007	(0.00001)
Hexachlorobenzene	0.0086	0.0086	(10)
Hexachlorobutadiene	7.48	7.48	(10)
Hexachloroethane	62.7	20	(20)
Bis(2-ethylhexyl)phthalate	59*	10	(10)
PCB 1248	0.0009	0.0009	(1)
Mercury	0.025	0.025	(0.2)
Copper	4.37	4.37	(10)
Hexavalent Chromium	50	10	(10)
Barium	--	10	(--)
Lead	3.85	3.85	(5)
Nickel	13.2	13.2	(40)
Zinc	89	20	(20)
Vanadium	--	10	(--)
Phenanthrene	4.6	4.6	(10)
Acenapthene	2700*	10	(10)
Acenapthylene	--	10	(10)
Benzo(k)fluoranthene	0.49*	0.49	(10)
Fluorene	14000*	10	(10)
Fluoranthene	370*	10	(10)
Pyrene	323*	10	(10)
2-Methyl napthalene	--	10	(10)
Napthalene	--	10	(10)

*EPA criterion

EXECUTIVE SUMMARY

Under a Consent Decree (Docket No. H 91 3072) reached between the City of Houston and the Environmental Protection Agency (EPA), the City agreed to conduct a toxicity study of the Houston Ship Channel (HSC), tidal portions of tributaries and side bays. Emphasis was placed on tidal tributaries. The study included chemical analysis of ambient water, sediment, and edible tissue of fish and crabs and also included short-term chronic toxicity testing in ambient water and sediment. Sampling of ambient water was conducted during various flow conditions.

The objectives of the study were to: (a) review and briefly summarize the recent historical data on toxicity and chemical concentrations of toxic substances for the HSC and associated waters; (b) chemically analyze conventional and toxic substances in ambient water during low flow and wet weather conditions; (c) conduct short-term (7 day) chronic toxicity tests for ambient water during low flow and wet weather conditions; (d) chemically analyze and conduct short-term (10 day) toxicity tests for sediments; (e) chemically analyze edible tissue of seafood organisms; (f) assess fish pathology (limited to selected sites); and (g) compile all data generated and analyze results in a final report.

The design and conduct of the study was directed and monitored by a Special Ad Hoc Settlement Implementation Committee (Oversight Committee) chaired by a representative from EPA. This report presents the results of the year long chemical and toxicity study.

The Houston Ship Channel (HSC) is a 50-mile waterway extending from the Gulf of Mexico through Galveston Bay to Morgans Point and then inland to near downtown Houston. For this study, 35 sampling stations, shown on Figure E-1, were located along the upper Ship Channel from the Turning Basin to Morgans Point, nine major tributaries (including the San Jacinto River) and five side bays. Sampling was initiated in August 1993 and concluded in May 1994. The study was designed to include sampling during: summer low flow, winter low flow, wet weather, and to assess temporal variability.

Prior to sampling, a Quality Assurance Project Plan (QAPP) was developed and data were compiled from previous studies. The QAPP defined sample collection and handling, chemical analyses, toxicity testing, precision and test acceptability, representativeness and comparability, and quality assurance/quality control. An earlier study of the HSC and tidal San Jacinto River

by EPA (EPA 1991) provided significant background data and direction for the selection of sampling locations and tests.

Sampling was conducted in two phases. In the first phase, water and sediment samples were collected from 35 stations during summer low water flow conditions. Also, water samples were collected every two months over a one-year period from five stations (Stations 5,12,15,17 and 27) to evaluate temporal variability of pollutant concentrations and ambient toxicity. The five stations were selected from the original 35 stations to include two stations in the HSC, two stations in tributaries and one side bay station. Data collected during the first phase were evaluated so that a sampling plan could be developed for the second phase. Therefore, the second phase was designed to focus on stations with the greatest potential for useful data.

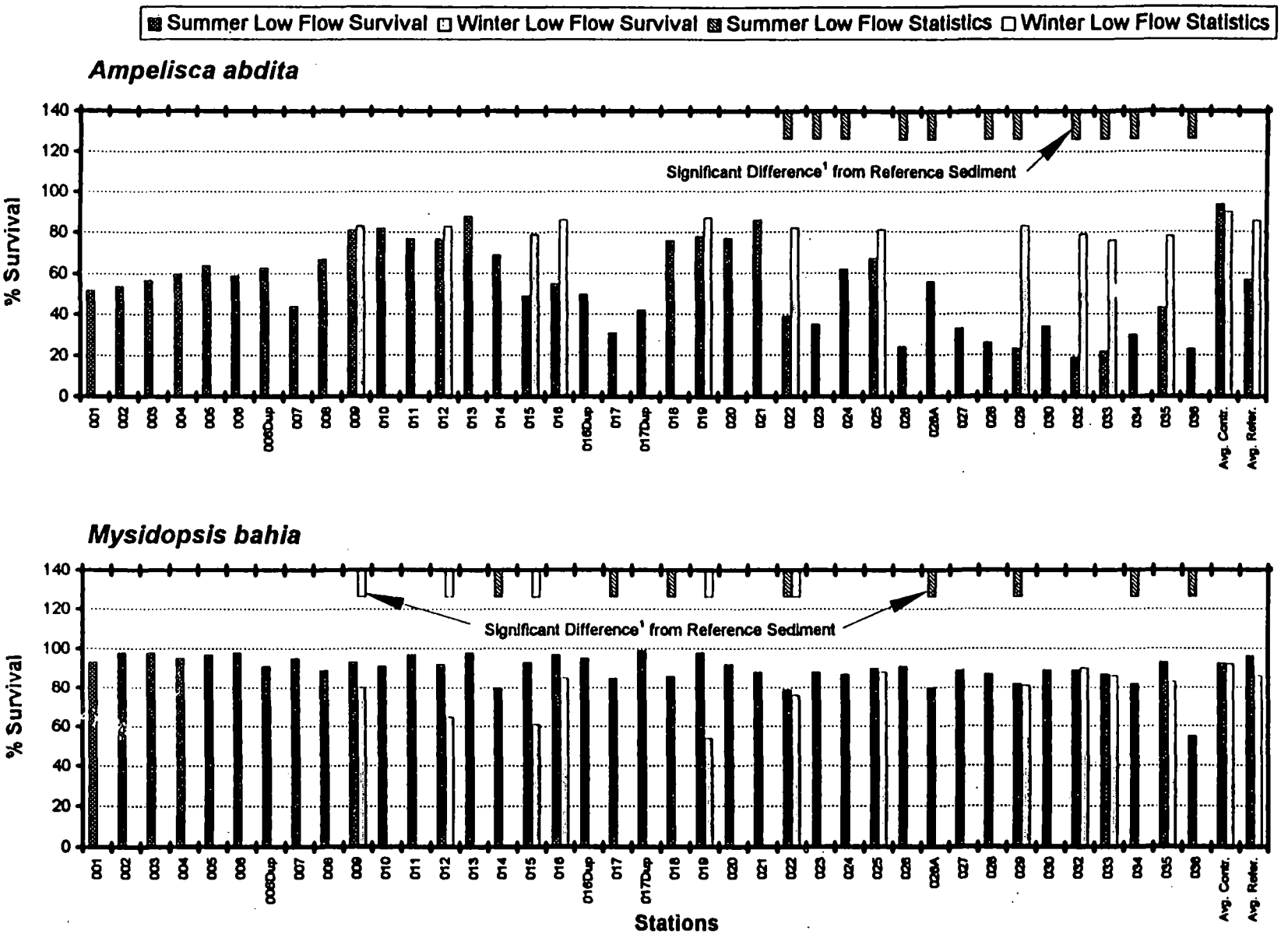
The second phase of the study began with the collection of water and sediment samples, during winter low water flow conditions, from 11 stations (Stations 9,12,15,16,19,22,25,29,32,33 and 35) selected from the original 35 stations. Following a heavy rainfall over the project area, water samples were also collected from three HSC stations and seven tributary stations for toxicity testing and chemical analysis. Fish and blue crabs were collected for tissue analyses at three HSC sampling stations (Stations 1,7 and 17) from Greens Bayou to Morgans Point, the San Jacinto River (Stations 9 and 10) and Patrick Bayou (Station 16). Finally, a special sampling event was conducted in May, 1994 to focus on dioxin/furan analyses of sediment samples. Seven stations (Stations 7, 9, 10, 15, 16, 17A and 26A) were selected in the HSC, Patrick Bayou and San Jacinto River.

For ambient water, certain "general chemistry" parameters were routinely analyzed in ambient water -- ammonia-nitrogen, total dissolved solids (TDS), total suspended solids (TSS), volatile suspended solids (VSS) and total organic carbon (TOC). In addition, water temperature, salinity, pH, specific conductivity and dissolved oxygen (DO) were routinely recorded by field instrumentation during each sampling. Ultra clean sampling and chemical analytical methods were employed for the 13 "priority pollutant" trace metals. Both the dissolved and particulate fractions of the water samples were analyzed -- particulate results were obtained from the analysis of material retained on two filter types. Water, sediment and fish/crab tissue samples were analyzed for a full range of volatile and semi-volatile industrial chemicals as well as a wide range of pesticides, polychlorinated biphenyls (PCBs), dioxin/furans and other potentia contaminants.

Number of Samples Exceeding Comparison Values

With Relation to:	Parameter	Number of samples	Buffalo 36	HSC 33	HSC 17	HSC 7	HSC 1	Brays 32	Sims 29	Sims 27	Vince 25	Vince 24	Hunting 23	Hunting 22	Hunting 21	Greens 19	Patrick 16	Patrick 15	Patrick 14	Carp. 12	San Jacinto 10	San Jacinto 9	COMMENTS
1 AMBIENT WATER																							
TNRCC Toxic Standards--Acute & Chronic toxicity and Human Health	Total Mercury	141	1	1	1					3					1				2			15 other stations were sampled which produced no exceedance
	Dissolved Copper	141								1						1						1	
	DDD	60																1					
	DDT	60																1					
	Endosulfan I	60																1					
	Endrin	60																1					
	Dieldren	60			1					1													
	Lindane	60																1					
	(A total of 151 Parameters were analyzed for water)																						
EPA Criteria																							
	Ammonia-N	71						1	1		1								1	2			
	bis(2-ethylhexyl)phthalate	60																		1			
Number of samples/station			2	2	5			2	2	5	2				2	2		4	1	5		3	
2 SEDIMENT																							
NOAA ER-M Guideline values	Chromium	49							1									1					
	Mercury	49															1						
	Nickel	49							1														15 other stations were sampled which produced no exceedance
	Silver	49							1								1						
	Zinc	49						2					1	1									
	Pyrene	49									1	1							1				
	Benzo(a)anthracene	49																	1				
	Dibenz(a,h)anthracene	49																	1				
	Chrysene	49																	1				
	Benzo(a)pyrene	49																	1				
	PAH, total	49																	1				
	aroclor 1248	49																1					
	(A total of 153 Parameters were analyzed for sediment)																						
Number of samples/station								2	2		2	1	1	2			3	3	1				
3 TISSUE																							
EPA Fish Tissue screening values	Arsenic	12			1	1	1																Fish and crab samples were collected from five stations, an additional crab was collected from station 16 and analyzed or for dioxin/furan
	Chrysene	12			1																	1	
	Benzidine	12				1	1														1	1	
	Aroclor 1260	12				1																1	
	Dioxin/Furan TEQ	12			2	3	2														1	2	
	(A total of 116 Parameters were analyzed)																						
Number of samples/station					2	3	2														2	2	

FIGURE E-2 SEDIMENT BIOASSAY SURVIVAL RESULTS



[1]Significant difference is used here to mean both a statistically significant (95% confidence) difference and an absolute-value difference of ≥ 10% for Mysids and ≥ 20% for ampelisca.

for *Ampelisca* survival at almost all of the stations during the summer low flow event. A Trinity Bay reference sediment along with the lower channel side bay stations had intermediate survival. Compared to the reference sediment, significant *Ampelisca* toxicity was primarily in the upper portion of the HSC and tributaries during the summer. Mysid survival was generally good for the summer samples, but relatively poor for mid-channel samples during the winter. *Ampelisca* survival was good in the winter samples, although three stations, Patrick Bayou (Station 15), Brays Bayou (Station 32), and the HSC Turning Basin (Station 33), also had differences from control (but not reference) sediment that were less than 20% but still statistically significant. Mysids also had significant differences from control (but not reference) sediment at Station 29 (mid Sims Bayou) in both summer and winter. Despite extensive efforts, it was not possible to determine which chemical or physical parameters or combinations of parameters might be responsible for the observed toxicity. A significant correlation was found between overlying water oxygen levels and *Ampelisca abdita* survival suggesting that the toxicity might be related to anoxic sediment conditions which are common during the summer in the upper HSC and tributaries.

Sediment - Tributyltin. Tributyltin (TBT) was detected in all ten of the samples analyzed, from stations in the HSC (Stations 1,7,17 and 33), San Jacinto River (Stations 9 and 10), Tabbs Bay (Station 2), Greens Bayou (Station 20), Hunting Bayou (Station 23) and Brays Bayou (Station 32). Concentrations were highest in the HSC at the San Jacinto Monument (Station 7) and Brays Bayou (Station 32). All concentrations exceeded 5 parts per trillion which is a value indicative of contamination, based on data collected under EPA's Environmental Monitoring and Assessment Program (EMAP). The use of TBT is restricted by EPA since it is toxic and bioaccumulative. In the past, TBT was used as a component in marine anti fouling boat paint since it has biocidal characteristics which limit encrustation.

Fish and Crab Tissue - Metals. All metals, except Antimony, Lead and Thallium, were detected in the fish and crab tissue samples. Only arsenic exceeded an EPA Fish Tissue Screening Value at three HSC stations (Stations 1,7 and 17).

Fish and Crab Tissue - Organics. Twelve semi-volatile organic compounds were detected at least once in the fish and crab tissue samples. Phthalate esters were the most commonly identified compounds. The concentrations of benzidine and chrysene in blue and hardhead catfish tissue exceeded the EPA Fish Tissue Screening Value for fish taken from the HSC (Stations 1,7 and 17)and the San Jacinto River near the Interstate 10 bridge (Station 9).

An EPA recommendation was to better characterize the tidal tributaries to the HSC. This study focused on the tidal tributaries, collecting a substantial portion of the data from these stations. With the exception of Patrick Bayou, the tributary ambient water data are generally similar to the data from the corresponding main stem of the HSC. Regarding the sediment parameters, some tributaries showed a greater degree of contamination than the main stem of the HSC. Patrick Bayou showed significant higher contamination with both ambient water and sediment. The stations in the side bays of the lower HSC were in the best condition, with no exceedances o comparison values.

Nickel in Water. Two EPA recommendations deal with concerns over nickel found at relatively high concentrations in the HSC. With the more accurate ultra-clean chemical analytical method used in this study, most of the trace metals (including nickel) were well below applicable chroni criteria. The lower concentrations found in this study were independently confirmed throug similar ultra-clean analyses performed by TNRCC. Improvements in wastewater treatmer between the two studies could also contribute to the different results.

Fish and Crab Tissue. An EPA recommendation was for periodic monitoring of selecte parameters in edible seafood tissues. Since fish and crab were collected from October 1993 t May 1994 and from six stations (Stations 1, 7, 9, 10, 16 and 17) in the HSC and San Jacin River, this study provided data over a range of flow, temperature, seasons, and locations. EP fish tissue Screening Values were exceeded by two to four parameters at five of the six statior (see Table E-1). The high contaminant values found in the earlier EPA study were not confirme by this study.

Toxicity. Yet, another recommendation was for additional toxicity testing. This study provid a substantial amount of additional toxicity testing on both ambient water and sediment.

Ambient water column toxicity was not a problem at most sampling locations. An exception w Patrick Bayou (Station 15), where toxicity was frequently observed. Unlike other static sampled during this study, the two upper stations in Patrick Bayou (Stations 14 and 15) we located within mixing zones. The state water quality standards include a prohibition on ac toxicity within mixing zones. It should be noted that although chronic tests were conduct these tests can also yield acute toxicity data. In some cases acute toxicity to the mysid v observed for Patrick Bayou (Station 15).

Sediment toxicity was somewhat inconsistent on a system wide basis, based on the repea sampling at some stations. Significant toxicity to *Ampelisca abdita* was found at a numbe stations during the summer sampling, but during the winter sampling, only three stations, Pat Bayou (Station 15), Brays Bayou (Station 32) and the HSC Turning Basin (Station 33) sho

26A) and the Kraft mill discharge (Station 17A) are not unexpected. The wastewater treatment facility also treats paper mill effluent.

Water Body Spatial Differences. There were marked spatial differences in chemical and toxicity results.

- Tabbs, Black Duck, Scott, Upper San Jacinto and Burnett Bays-- The stations in the side bays (Stations 2 through 6) adjacent to the lower HSC had good water and sediment quality--there were no chemical observations higher than the comparison values, no water toxicity and relatively little evidence of sediment toxicity was exhibited.

- HSC and Brays, Sims, Carpenters, Hunting and Vince Bayous--The upper channel and these major tributaries each had a few chemical test results (ranging from three to nine, refer to table E-1) above comparison values, but ambient water toxicity test results were almost all negative. Sediment toxicity was observed in many of these stations during the summer but was less common in winter sampling.

- Buffalo and Greens Bayous and San Jacinto River--Each of these major tributaries had only one chemical test result above comparison values although Station 9 on the San Jacinto River had unusually high TEQ values for sediment. There was no reported ambient water toxicity.

- Patrick Bayou--The major spatial difference was with the two upper stations (Stations 14 and 15). Water toxicity was observed frequently at Patrick Bayou (Station 15). Also observed were sediment toxicity and a higher percentage of chemical tests which either exceeded comparison values or were high enough in concentration to indicate the need for further investigation. TNRCC and EPA regulatory personnel have further investigated Patrick Bayou since receiving early results of this study.

In general, environmental conditions in the HSC have substantially improved in recent years. The last two decades have seen steady reductions in wastewater loadings resulting from permit regulation. Improvement in environmental measurement technology, particularly for metals, indicates less contamination from this class of parameters than was evident even as recently as the 1991 EPA report. However, some toxicity remains in the HSC-- a situation not surprising in view of the urban, industrial and transportation uses of this water body.

Table 3.2-12

Dioxin/Furan Concentrations in Sediment Samples (ng/Kg)

Parameter	Main Channel								San Jacinto River					Patrick Bayou		
	001[a]	007[a]	007[b]	017[a]	017A[b]	026A[a]	026A[b]	033[a]	008[a]	009[a]	009[b]	010[a]	010[b]	015[b]	016[a]	016[b]
2,3,7,8-TCDD	2.4	9.2	8.5	7.2	42.1	28.1	75.5	0.38	10.1	27.8	12.5			3.1	93.6	22.6
2,3,7,8-TCDF	6.9	22.9	26.4	21.7	104	89	296		29.9	73.3	33.4			83.6	290	74.3
Total TCDD	3.3	16.7	16.5	7.2	51.2	37.9	91.7	2.3	14.9	33.8	20.2			12.3		32.7
Total TCDF	11.2	38.1	53.9	30.5	227	186	576	2	56.4	168	67.2			432		229
Total PeCDD	22.7	15	17.4	1.3	1.4	1.5	4		3.7	8.9	12.8			115		8.6
Total PeCDF	4.5	8	10.5	4.2	26.6	87.2	101	40.7	12.4	28.7	19.9			1390		103
Total HxCDD	165	108	142	34.6	61.8	125	116	84.4	53.6	119	89.1			1800		160
Total HxCDF	6.7	13.2	21.6	15	39.5	82.1	136	64	19.2	43.5	122			3690		177
Total HpCDD	529	449	577	310	357	1080	788	959	187	531	356		24.6	25060		828
Total HpCDF	25.8	39.9	56.1	45.5	76.6	241	248	170	22.7	78.7	439			8780		332
OCDD	3460	3550	5070	3900	3830	5920	4820	4240	1040	3750	3450	58	336	81930	4900	5180
OCDF	63.2	205	442	88.4	272	284	477	181	111	742	525		5.4	7410	9840	6210
Toxicity Equivalence Calculations[c], TEQ^{O}	9.91	18.9	20.5	15.8	62.7	60.8	130	12.5	16.1	46.1	27.2	.57	.430	409	158	58.6
Toxicity Equivalence Calculations[c,d], $TEQ_{½}$	10.56	19.6	21.4	17.1	62.7	61.3	130	13.0	16.9	46.6	27.7	2.19	2.405	409	158	58.8

[a] - Summer Low Flow Sampling Episode (August, 1993)
[b] - Special Sampling (May, 1994)
[c] - Calculations using 1989 Toxicity Equivalence Calculation Factors.
[d] - Calculations using one-half the detection limit.

TABLE 3.2-7 (Concluded)
SEDIMENT METALS DATA

Station	Date	Dry Weight Concentrations in Sediment (mg/kg)													
		Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
009	3/2/94	< 6	2.7	0.9	< 0.5	21.8	10.9		23.8	0.3	11.3	< 1	< 1	< 0.5	49.5
012	3/2/94	< 6	5.2	< 0.5	< 0.5	26.3	14.8		35.8	< 0.1	15.3	< 5	< 1	< 0.5	89.0
015	3/2/94	< 6	7.0	1.0	< 0.5	29.6	39.4		56.3	0.6	38.0	< 5	< 1	< 1.0	94.9
016	3/2/94	< 6	5.1	< 0.5	2.1	43.3	27.3		37.0	1.5	23.6	< 5	2	< 0.5	165.0
019	3/2/94	< 6	8.9	< 0.5	< 0.5	28.0	14.2		36.4	< 0.1	15.5	< 5	< 1	< 1.0	121.1
022	3/2/94	< 6	4.0	< 0.5	1.2	20.1	26.0		58.8	< 0.1	10.9	< 5	< 1	< 0.5	231.8
025	3/2/94	< 6	4.8	0.6	< 0.5	23.8	13.4		63.6	< 0.1	14.4	< 5	< 1	< 0.5	103.9
029	3/2/94	< 6	2.7	< 0.5	< 0.5	37.7	33.8		38.9	< 0.1	20.0	< 5	4	< 0.5	168.9
032	3/2/94	< 6	2.8	< 0.5	1.1	29.6	56.8		62.3	0.3	18.4	< 5	< 1	< 0.5	252.8
033	3/2/94	< 6	3.3	< 0.5	1.0	23.3	31.9		61.1	< 0.1	16.5	< 5	< 1	< 0.5	207.4
035	3/2/94	< 6	1.3	< 0.5	< 0.5	16.4	16.1		33.5	< 0.1	11.4	< 5	< 1	< 0.5	105.7
015	5/3/94	< 6	2.5	< 0.5	< 0.5	370.4	38.8		42.3	< 0.1	32.1	< 1	< 1	< 5.0	228.2
016	5/3/94	< 6	5.1	1.4	3.5	52.1	33.6		35.2	0.7	25.2	< 1	< 1	< 2.5	208.5